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World War 3D

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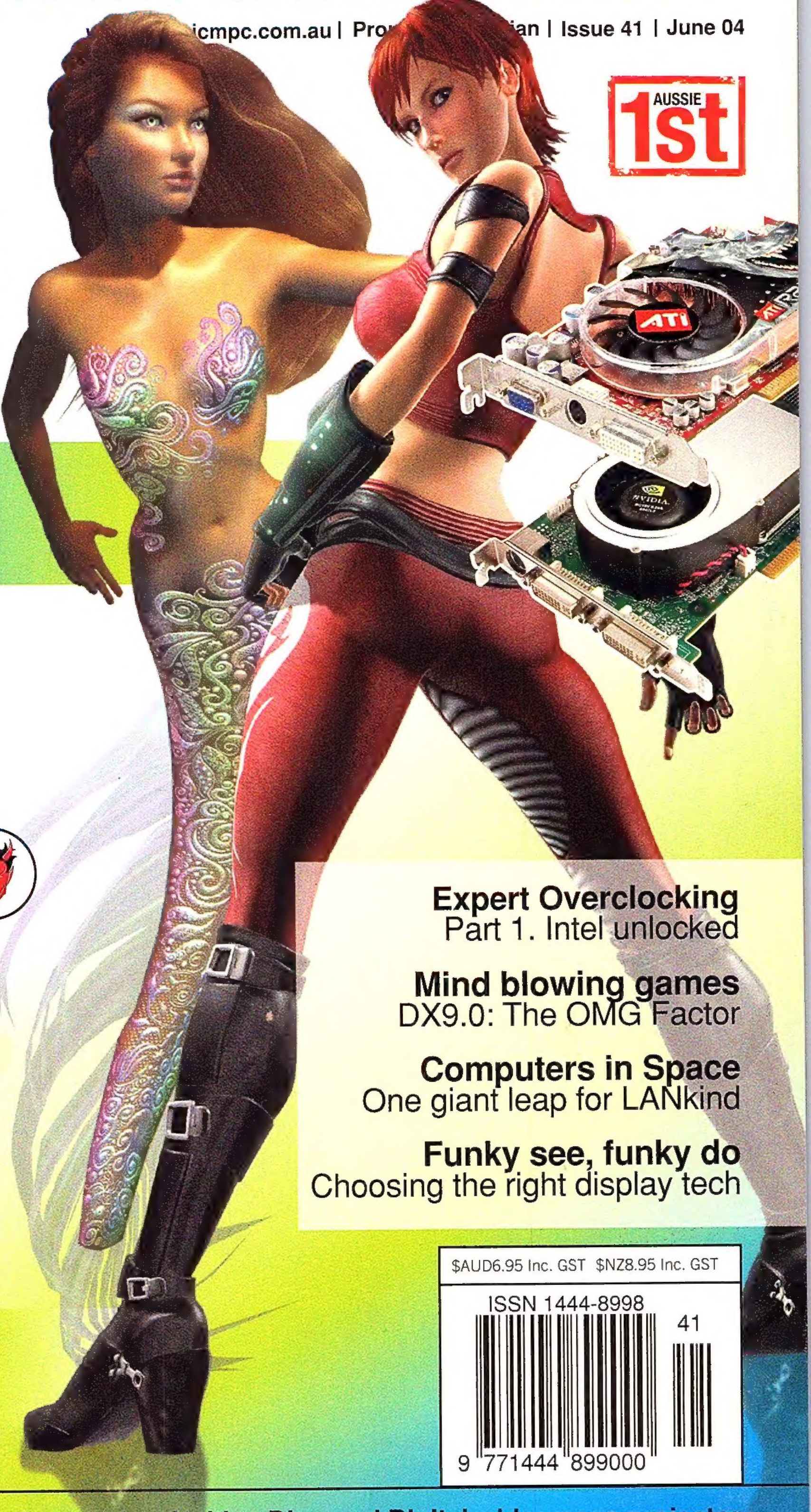
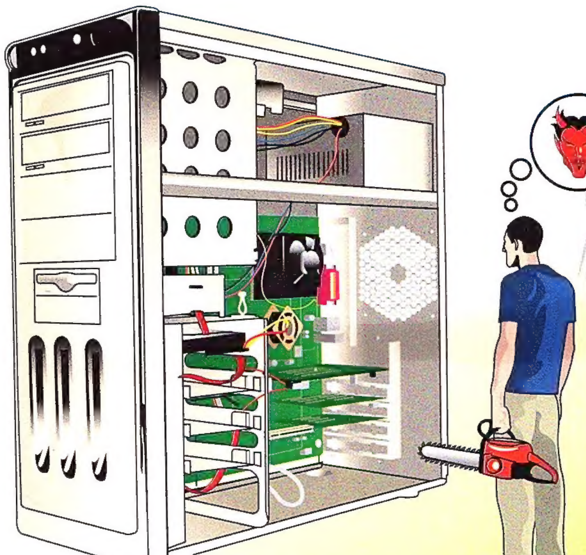
BENCHTESTS

RADEON X800 vs GeForce 6800

AUSSIE 1st





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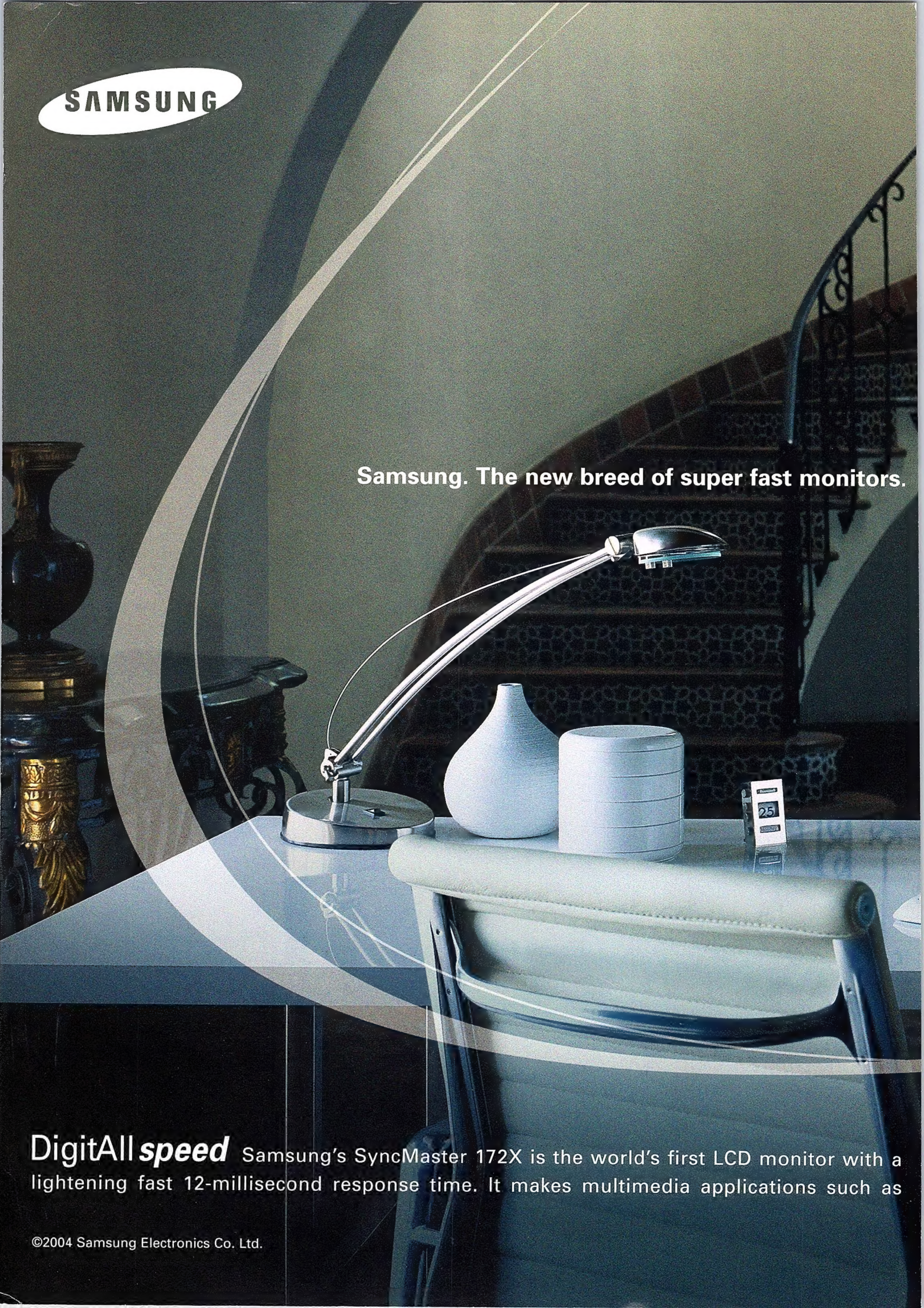

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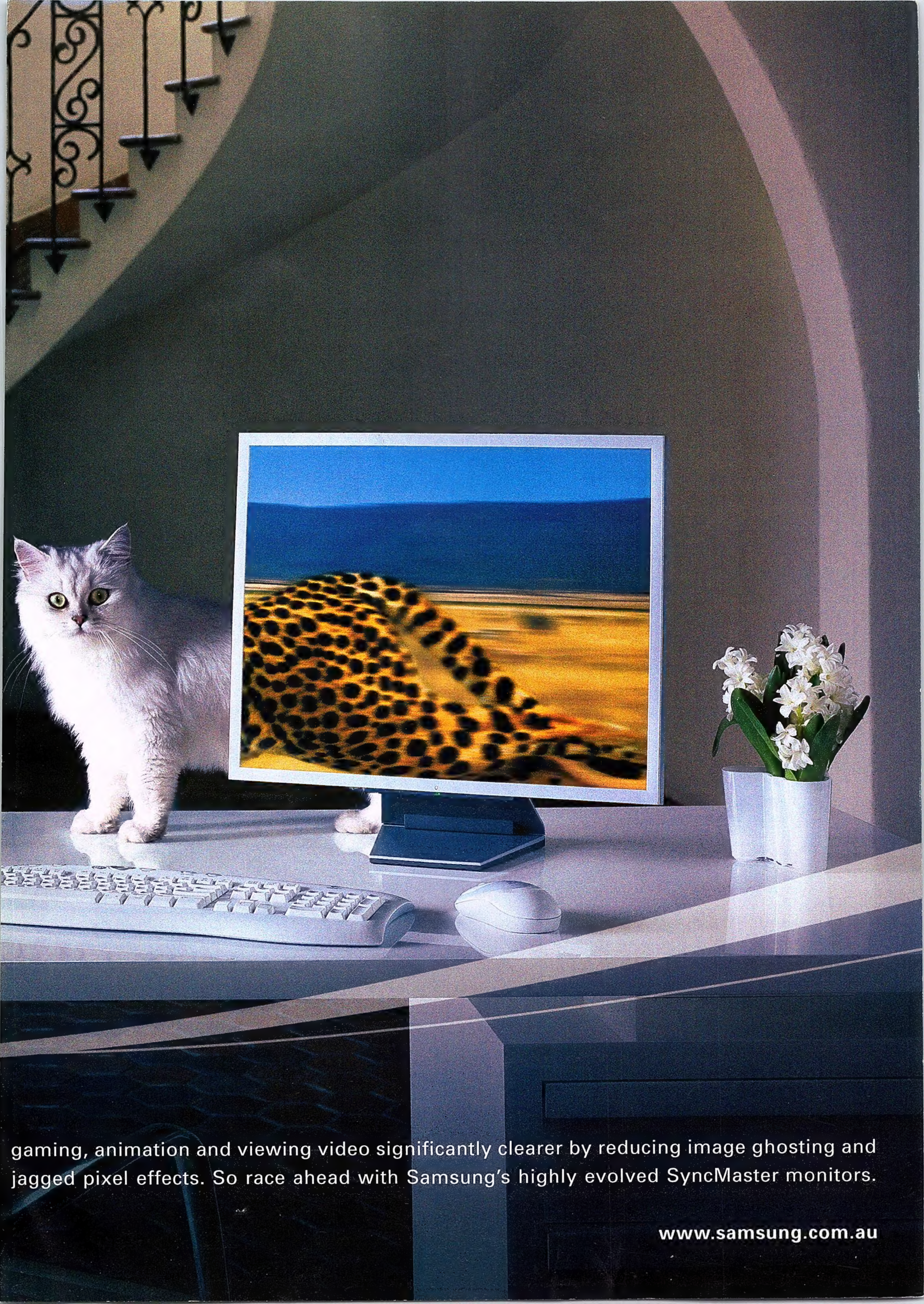

gaming, animation and viewing video significantly clearer by reducing image ghosting and jagged pixel effects. So race ahead with Samsung's highly evolved SyncMaster monitors.

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June **2004**

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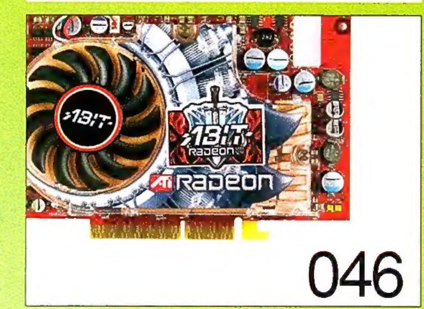
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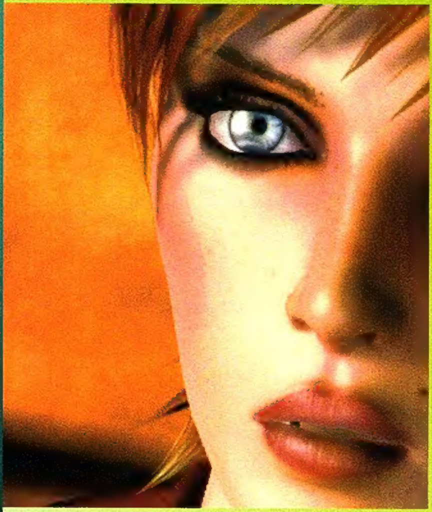
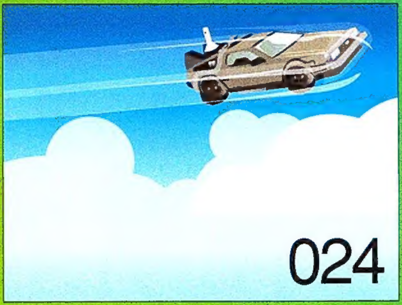
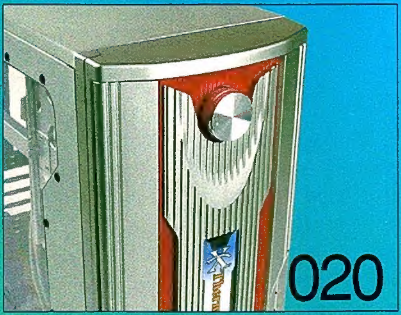


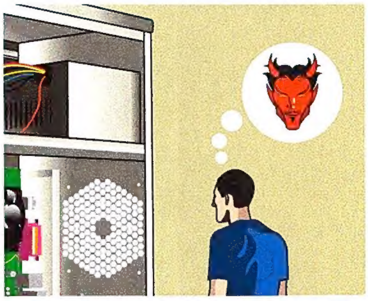
head to head

World War 3D 028

The next generation of graphics cards is here. Shiny, smoking and ever so advanced, NVIDIA's GeForce 6800 and ATI's RADEON X800 are just itching to race each other in a frenzy of benchmarks. Who are we to stand in their way? John Gillooly drops the chequered flag.





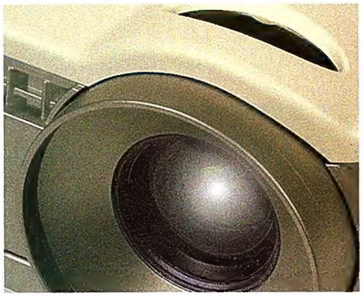


feature **Overclocking** 038

Speed. It's the vicious battle every performance enthusiast must participate in; a combat so mortal, only the most experienced prevail. It's an art, a skill, a finely honed, specialist ability that allows the proficient to squeeze the unsqueezable from their system, prolonging its usefulness, improving efficiency, and let's face it, making games run that much smoother.

Think you have what it takes to become a finely tuned tool of overclocking perfection yourself? Then check out the ultimate guide to performance boosting right here, in this month's issue. Experience the rush through the eyes of Chris Byrne, speed hacker extraordinaire.

Come share his magic.



x-ray **Display tech** 026

Cathode ray tubes. Liquid crystal displays. Lights, spots, lasers and plastic make up our gateways to the land of the computer. This land can be another world, an alien spaceship, the priceless pink flesh of a young peach, or an Excel spreadsheet. Like a Choose Your Own Adventure novel, it's your choice, bucko.

But enough of this. No matter how many times it's explained to us, monitors – in whatever form they may come in – continue to amaze us with what they do. These feats in technology must do so much, and be built to such exacting standards, it's a wonder they exist at all. Daniel Rutter is today's display teacher on CRT and LCD technology, and he has a lot to say.

feature **Computers in Space** 032

'Space. It seems to go on and on forever, then you get to the end and a gorilla starts throwing barrels at you.'

So began the television series *Futurama*. It seems that things space related have always been in computers, but what about the computers in space? Is there actually any hardware onboard the Shuttle with enough power to play Wing Commander, or is it only able to run Asteroids with an accpetable framerate? Dan Rutter answers these questions and more as he boldy goes where no Dan has ever gone before.

edhead

Atomic forever

Atomic winning Best Technology Mag for Professionals and Enthusiasts (*see news, page 11*) is a wonderful reward for our team. We have always known we have something special here, which comes only from working damn hard to *make* it special. Damn straight. Getting the nod from our peers is a nice feeling. But it is from you, our dearly treasured readers, that we have had the kindest praise, the most considered feedback and occasionally, the most well-deserved constructive criticism.

This magazine has come a long way in 41 issues. It has evolved, it has matured. It will continue to do so.

The growing *Atomic* universe has always been more than this magazine. It could not be what it is without the site (www.atomicmpc.com.au), which we launched the day Issue 1 went on sale.

In my wildest dreams, I've always wanted the *Atomic* site to have the resources it needs to do really special stuff. I know too that if you're a regular to the site, you may share that feeling. As a growing publishing company, our initial focus had to be the mags. Now, my friends, AJB is committing to doing our sites in a grand manner befitting its mags. To give people who come to visit *Atomic* and our sister mag, *PC Authority* (www.pcauthority.com.au), so much more, to create *online magazines* which complement the flourishing print versions.

Recently, my wise and attractive boss asked me if I would like to take on this challenge. After a couple of weeks of deep Jedi-like meditation, I have accepted.

Thus, I, my friends, will be the producer for these sites, as well as anything else we do for consumers online, plus magical special projects, which will be *good*. I'll be building a new team – journalists and developers – to do it *right*. I'm excited. As excited as I was when we were planning the first issue of *Atomic*.

It'll be a big job. As big a job as being editor of the magazine is. And a boy can't have two jobs and be doing them both properly. So...

This will be my last issue as editor of *Atomic* magazine. *Atomic* magazine, and the team who puts it together, are wonders I'm proud beyond words of. That we've also got this great award under our belts makes it the perfect time to move on to a new challenge. Time to start another good thing I can be proud of and you can enjoy. Time to let someone new take the reigns of the mag and take it where they see fit.

Walking away from this magazine isn't easy. It was a damn tough decision, but the call of online appeals. Doing the mag is still enormously satisfying, but no longer formidable and scary. Another reason to change. Jumping to online feels like leaping into the heart of the *Atomic* community. A nice reason to change. And, with some good hard work, we will make a global online audience aware of our wonderful magazine, growing it and creating a monster mag!

Ultimately, it's more *Atomic* for you. I'm excited to see what the new mag editor will do, and what I and my new online team can do to expand both parts of the *Atomic* universe.

Thank you everyone, for everything.

xxx

Ben

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MAXIMUM POWER COMPUTING

Editorial
Editor: Ben Mansill bmansill@atomicmpc.com.au
Technical Editor: John Gillooly jgillooly@atomicmpc.com.au
Interactive Coordinator and
Staff Writer: Logan Booker lbooker@atomicmpc.com.au
Staff Writer: Nathan Davis ndavis@atomicmpc.com.au
Senior Sub Editor: Melanie Farr mfarr@atomicmpc.com.au
Sub Editor: Claire Doble cdoble@atomicmpc.com.au

Design
Designer: Tim McPherson tmcpherson@atomicmpc.com.au
Product Photography: Chris Walsh

Contributors
Charlotte Mather, Tim Dean, Stuart Denham, Ashton Mills, Simon Peppercorn, Phil Chia, Daniel Rutter, Craig Simms, Maurice 'moz' Ford, Virtuoso, James Wang, Darren Ellis, Ron Prouse, Peter Sbarski, Allison Reynolds

Production
Head of Production: Angela McKinnon amckinnon@atomicmpc.com.au
Production Coordinator: Melanie Wells mwells@atomicmpc.com.au
Traffic Coordinator: Marissa McGarry mmcgarry@atomicmpc.com.au

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Gordon & Gotch Australia (03) 9805 1650
Gordon & Gotch New Zealand (09) 625 3005

Advertising + Marketing
t + 61 2 8399 3611 t + 61 2 8399 3622
Account Manager: Alex Harding aharding@atomicmpc.com.au
Head of Marketing: Kate Imberti kimberti@atomicmpc.com.au
Head of Sales: Shane Mitchell smitchell@ajb.com.au
Loyalty Marketing Manager: Lucia Cursio lcursio@atomicmpc.com.au

AJB Publishing
t + 61 2 8399 3611 f + 61 2 8399 3622
PO Box 2286 Strawberry Hills, NSW 2012 Australia
CEO: Adrian Jenkins ajenkins@atomicmpc.com.au
General Manager: Simon Corbett scorbett@atomicmpc.com.au
Head of Editorial: David Hutchins dhutchins@ajb.com.au

Subscription enquiries (including change of address)
Aust : t +61 2 9492 7399 f +61 2 9492 7310
e subscriptions@atomicmpc.com.au
NZ : t +64 9 625 3005 f +64 9 625 3006
e csharland@gordongotch.co.nz

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Editorial and product submission: *Atomic* welcomes all information on new and upgraded products and services for possible editorial coverage. However, we respectfully point out that the magazine is not obliged to either review or return unsolicited products. The Editor welcomes ideas for articles, preferably sent in outline form, with details of the author's background and a few samples of previously published work. We cannot accept responsibility for unsolicited copy and stress that it may take some time for a reply relating to these submissions to be sent out.

Artomic: All submissions must be the original work of the person submitting, and submitted works become the property of AJB Publishing.

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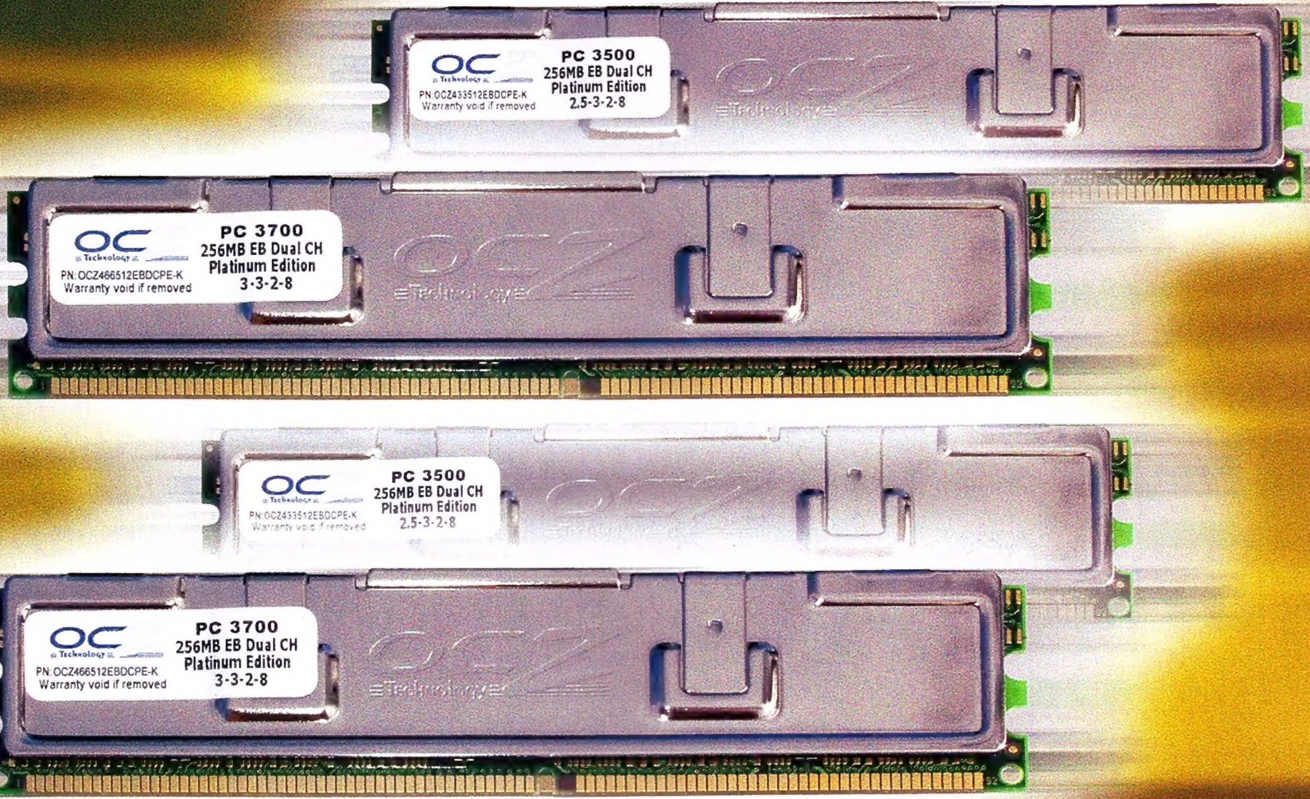

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CDGuide

Atomic Overclock Shop

Guided CD

Overclockers unite! Whether you're a veteran, or novice, this month's CD is for you. Stocked with the elite tools of the trade, including benchmarks and diagnostic apps, CD #12, or as we like to call it, the *Atomic* Overclock Shop, is all you'll need software-wise to test and retest your system. Keep it near.

Overclocking is the heart and soul of the Atomican's spirit. It's a fun little hobby, to tinker and play with the innards and get a free performance boost, so you can get better frame rates in Far Cry.

THE BREAKDOWN

Benchmarking tools

No overclocker would call themselves an overclocker without a solid suite of benchmarking tools. Once you've ramped up the speeds on your CPU and front side bus, there's only one way to check if your hard work's been worthwhile. This month we've packaged 3DMark03 and 3DMark2001, along with all their updates, as well as some more specific CPU and memory benchmarks including CPUBench2003 and Memtest86.

Compression tools

Golly! Whether you need to uncompress a file we've included on the CD, or nab yourself some extra hard drive space by shrinking all those unused files, or fire something over the internet all archived up, you'll need a compression program. This month's CD has the four best archiving tools available: WinZip, WinRAR, 7-Zip and WinAce. Pick your favourite and compress away!

Diagnostic tools

Benchmarks are good and all, but when you want to test stability and other related stuff, you'll want some tight diagnostic tools. Designed to report on your system's configuration, including bus and CPU speeds, memory timings and sizes, PCI slots, hard drives and operating system characteristics, diagnostic tools provide a much needed, and informative, look at how your PC is running. SiSoft Sandra and CPU Z, among others, cover this section nicely.

Magazine

This special part of the CD carries additional magazine content. At the moment, it stocks the ultimately special Benchmarks page, filled with links and info on our favourite testing tools. Curious as to what hardware we test with? How about the games we use? If so, then give this page a glance over. It provides enlightenment on levels we can't even begin to explain.

Miscellaneous

Your requests section.

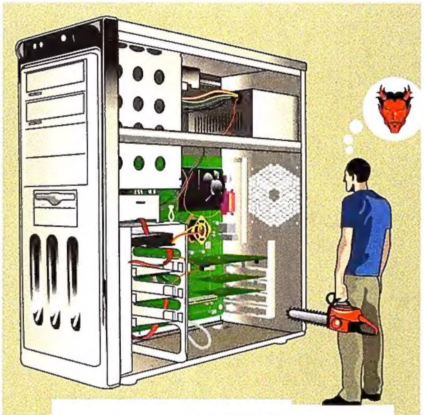
Every single request you send in is considered carefully for inclusion in the magnificent Miscellaneous section. Stalwarts Adobe Acrobat and Mozilla Firefox call this category home, and if we think a suggested program comes as close to perfection as these two lovely apps, it'll find itself rubbing shoulders with the big names of freeware.

So send in those requests to cd@atomicmpc.com.au.

Boot sector

At *Atomic*, we believe in keeping one's system as up-to-date as humanly possible. While vendors recommend you only install new drivers if you're having problems, we all know that vendors don't really understand what drivers are. They're performance-boosters and stability-finders.

They're the difference between an out-of-date system, and a system you care about. Deeply. Tucked inside Boot sector this month are the latest NVIDIA, ATI, SiS and VIA drivers, not to mention updates from Intel and Creative.



WHY YOU WANT ME

- Your overclocking companion – benchmarks and diagnostic tools
- Latest updates and versions of 3DMark03 and 3DMark2001 SE
- SiSoft Sandra 2004; the ultimate benchmarking and system info tool
- Symbiotic relationship with this month's massive overclocking guide
- Get more performance from your system without spending a cent!

S.T.A.L.K.E.R.

S.T.A.L.K.E.R.: Shadows of Chernobyl is so beautiful we just had to include some extra screenshots and the latest preview movie on the CD to complement this month's Engine Room. Take a look, it is dead sexy.

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News

ABOVE: *Atomic* wins Best Technology Title for Enthusiasts and Professionals.

ABOVE: Ashton Mills wins the Golden Lizzie for Best Technology Journalist.

LEFT: John Gillooly wins Best Gaming Journalist.

Sun Microsystems/ITJourno Awards

One glorious night on 2 April, the collective gang of *Atomic* and *PC Authority* journos made its way to the prestigious 2003 ITJourno Awards, where the efforts of journalists, sub-editors and designers, as well as magazines, are recognised. It's the Oscars, Academy Awards and Logies of the IT media world.

It was a big night.

We arrived in short order, all suity-suited and ready to dance. While sorely disappointed by the 'No Dancing' sign that warmly greeted us at the entrance, we were pleasantly surprised by the red carpet, drinks, and lovely view. Sponsors Sun Microsystems left nothing out, and put everything in to make it a great gig. Good on you Sun.

After an hour or two of cocktails, wine and other assorted alcoholic beverages, we strutted into the dining area and the awards got underway. The lads waited in anticipation as the awards and their winners were read out. The sheer number of categories we found ourselves in was staggering: Best New Technology Journalist; Best Gaming Journalist; Best Technology Title for Enthusiasts and Professionals; Best Technology Journalist... the list goes on.

Each group of awards was declared in style – big screens, podiums and spotlights were in abundance. Each prestigious segment was separated by sections of entertainment, food, and drinks. Then finally, after a terrifically terrific dinner, came the big ones.

Atomic was up against every other IT magazine out there – and there's a lot. It represented tough competition from a field of respectable, professional titles, and each one deserved recognition and attention. But only one could win.

And, of course, we scooped a bunch of glittering trophies, including the biggest one. *Atomic*, being the technically astute publication that it is, won Best Technology Title for Enthusiasts and Professionals. Best Technology Journalist went to Ashton Mills, who also received a Highly Commended for Best Technology Columnist, and our very own John Gillooly was awarded Best Gaming Journalist. Stellar moments for the magazine and amazing recognition from the IT community at large.

LB

The specs of X?

What appears to be an early draft of the Xbox 2 hardware schematic recently leaked out onto the forums of a Chinese hardware website. Seeing as Chinese bulletin boards aren't the bastions of journalistic excellence, we need to take this with a dash of cynicism, but the specs for a system codenamed Xenon match well with what has been announced so far. And there's a few surprises as well.

Xenon features a Power PC chip that features three separate cores on the die. Each core features its own Vector Processing Unit and 64KB of L1 cache, although all three have to share the 1MB of L2 cache. Each core is running at 3.5GHz or above.

This then pairs up with an incredibly interesting graphics chip, which was rumoured to be based upon ATI's RADEON X800 architecture. However the chip in Xenon bears a couple of significant differences that seem more akin to the next generation R500 core, as it sports load balanced pixel and vertex shaders. It also has 10MB of eDRAM that could act as a kind of mini-framebuffer to allow for antialiased gaming at HDTV resolutions.

The existence of a hard drive remains undecided and there is an uninformative 256MB+ of an unspecified type of memory. People are split over the authenticity of the information, but consensus seems to be that this is an early concept diagram that still nails the essence of Xbox 2. Hopefully an announcement will come soon to clear up the confusion.

JG

ShortCircuits

- According to the National Infrastructure Security Coordination Centre, a serious vulnerability has been discovered within the TCP/IP protocol. By using specially-crafted TCP packets, a user can prematurely terminate a session, effectively performing a denial of service (DoS) attack. The crafted packet is simply an 'end session' signal, and accomplished by setting either the SYN or RST flags within the packet. The hard part for the potential 'hacker' is guessing the sequence number of the packet, which, according to the advisory is not easy. (www.uniras.gov.uk/vuls/2004/236929/index.htm)

- The world of graphics has been abuzz with news. NVIDIA recently announced Gelato, a hardware-accelerated final-film renderer. According to the press release, Gelato is '...the first commercially available application in the feature film segment to solve a critical problem – rendering – by using all of the mainstream hardware advantages available, such as floating point acceleration, 64-bit computing, PCI Express, and multithreading.' (www.nvidia.com). The company also announced its Quadro FX 4000, an NV40 for 3D graphics designers, while 3Dlabs released information on its new 'Realizm' architecture (www.3dlabs.com). Matrox, maybe feeling a little left out, decide to make known that it was working on a new Parhelia to compete with the latest next-gen cards (www.matrox.com) and ATI, well, its still pimping the X800 (www.ati.com).

- The Serial ATA Working Group has released specifications for the new iteration of SATA. Announced at the Intel Developer Forum in Barcelona, the revised spec promises a doubling of transfer speeds, from 150MB/s to 300MB/s, along with a series of new cable types. (www.serialata.org).

AUSEGAMER

This month has seen a large focus put on contractual obligation in professional gaming and e-sports. More and more big name companies are unwilling to put money into e-sports without stringent guidelines. Gone are the days when the local computer shop paid entry for a clan with the hope of having their name mentioned. Now big names like Subway, Coke and Intel are lining up to pay the salaries of tommorow's pro-gaming elite.

And so with it has come some of the greatest battles for clan supremacy. Those serious boys from Schroet Kommando (SK), currently the most lucrative team in Counter-Strike, have already announced their plans to be the first group ever to sue a gamer for breach of contract.

A few years ago there were three or four top Counter-Strike clans in the world. Most would agree that, of these, SK, eoL and 3D reined supreme. Things shifted dramatically when eoL called it quits and Ola 'elemeNt' Moum, already considered the best CS tactician in the world, was found clanless. He was quickly assimilated into SK as in-gamer leader. At the time he signed a contract binding himself to SK until October 2004.

While all this was going on, a small band of international e-sports stars got the idea that an international team, the first of its kind, would be just the ticket to slay the SK behemoth. Big names like Knoxville, Shaguar, Method, Naikon and Siege were pulled together from all over the globe to create clan NoA. Players from the US, Canada and Norway came together to pool their international talent. Those who raised eyebrows and questioned how a team thousands of kilometres apart could possibly practice enough to be competitive were shown up royally as the fresh NoA squad took second in the CPL Winter Championships. They were beaten by SK. Some boots were shaking in Sweden.

It then became obvious to some that Ola was taking a smaller role in SK every month; citing school commitments for his decreased participation. On 24 April, team manager Andreas Thorstensson announced on SK's website that Ola had broken his contract and the rumours started to float around the internet as to his future.

Shuffle over to TeamNoA.net and the big question was who their as-yet unchosen sixth player would be. Shaguar showed his wit, posting an amazing riddle on the site (www.teamnoa.net/?q=news&id=101) prompting a million theories as to who it could be.

The same day as SK announced his departure, the banner on GotFrag.net said it all: 'It's Ola!'. Many of us damned Shaguar for his riddle making skills, others, namely SK management, were thinking very differently.

Thorstensson was quoted on an offical news post on the SK website as saying that 'legal actions will be taken upon him, if he joins NoA, which is against his contract...'

Ola commented that, 'It's unfortunate that things didn't work out with SK, this is for the best and I hope they understand that.'

Forums exploded with with discussion on just what legal action would be taken against Ola. Supporters denounced the borg-like coldness of SK management, pleading for them to remember the community aspect of gaming, others pointed to the contract and sighed.

Both arguments seem to have garnered equal support, showing the divide in the old-school and new-school thinking. The question we have to ask ourselves is, do we want to be professionals with contracts, endorsements and everything that comes along with that, or semi-pro with the ability to control our own e-sporting destiny?

Stuart Denham

What's Hot

- *Atomic* – Award-winning magazine
- Xbox 2 – ATI, SiS and IBM combined
- Tony Tamasi – builds bridges, gives details
- Shader Model 3.0 – fluffy monsters and great dames
- Wizards – spells, magic and long beards!

What's Not

- 'No Dancing' signs – the groove subdued
- Xbox – still costing Microsoft
- Doug Lombardi – digs holes, starts avalanches
- Shader Model 2.0 – branch prediction? Pfft.
- Blizzard- rest periods and patch comps?

atomican

Physicists and sci-fi fans know that, when matter meets anti-matter, mass destruction ensues. NASA is reportedly searching for a way to harness this reaction, to fuel the next generation of spacecraft.

The *Atomic* Forums are already fuelled by the collision of opposites. Take one fervently held belief, inject it into a thread, and stir vigorously. Depending on the volatility of the subject and the temperature of the protagonists, the chain reaction may well engulf the forums and bring browsers to meltdown.

Sitting at the top of the explosive forum periodic table as a debate topic, is religion. Forum longtimers have observed that it's usually an atheist who catalyses a religious debate. It might be an observation about the hypocritical actions of a religious person, a Biblical contradiction, or a scientific treatise on the inherent paradoxes of a supreme creator. Whatever the atheistic allegation, true believers are quick to react. Tongues start clicking, and mouses thereafter. Pretty soon, postcounts are spiralling exponentially.

In fact, the mother of all religious threads – Bolero's 'Jesus: Just a Man?' – grew to such Biblical proportions that it had to be archived out of compassion for the suffering *Atomic* server. Fortunately, kindly forum SuperHero Mael gave it sanctuary at his Atomic Waste Depot (www.atomicwaste.net/atomic_weight.htm – Monster Threads) where it can be perused to this very day.

Of course, only the Supreme Creator knows if anyone has ever been converted or saved by a religious thread. Or, for that matter, whether they were saved from delusions of afterlife, or damnation during it! But everyone seems to enjoy them.

Religious fervour is not confined to debates about religion. Funnily enough, Atomicans often feel passionate about technical matters, too!

In the Tech Talk Forum, AMD aficiados regularly take on Intel idolisers. ATI adherents go up against NVIDIA enthusiasts. Linux lovers take the technical high ground against Windows worshippers. And everyone delights in pooh-poohing Apple Mac addicts.

Meanwhile, over in the gaming forums, PC players take their console counterparts to task. The console gamers give as good as they get before splitting into PlayStation and Xbox factions.

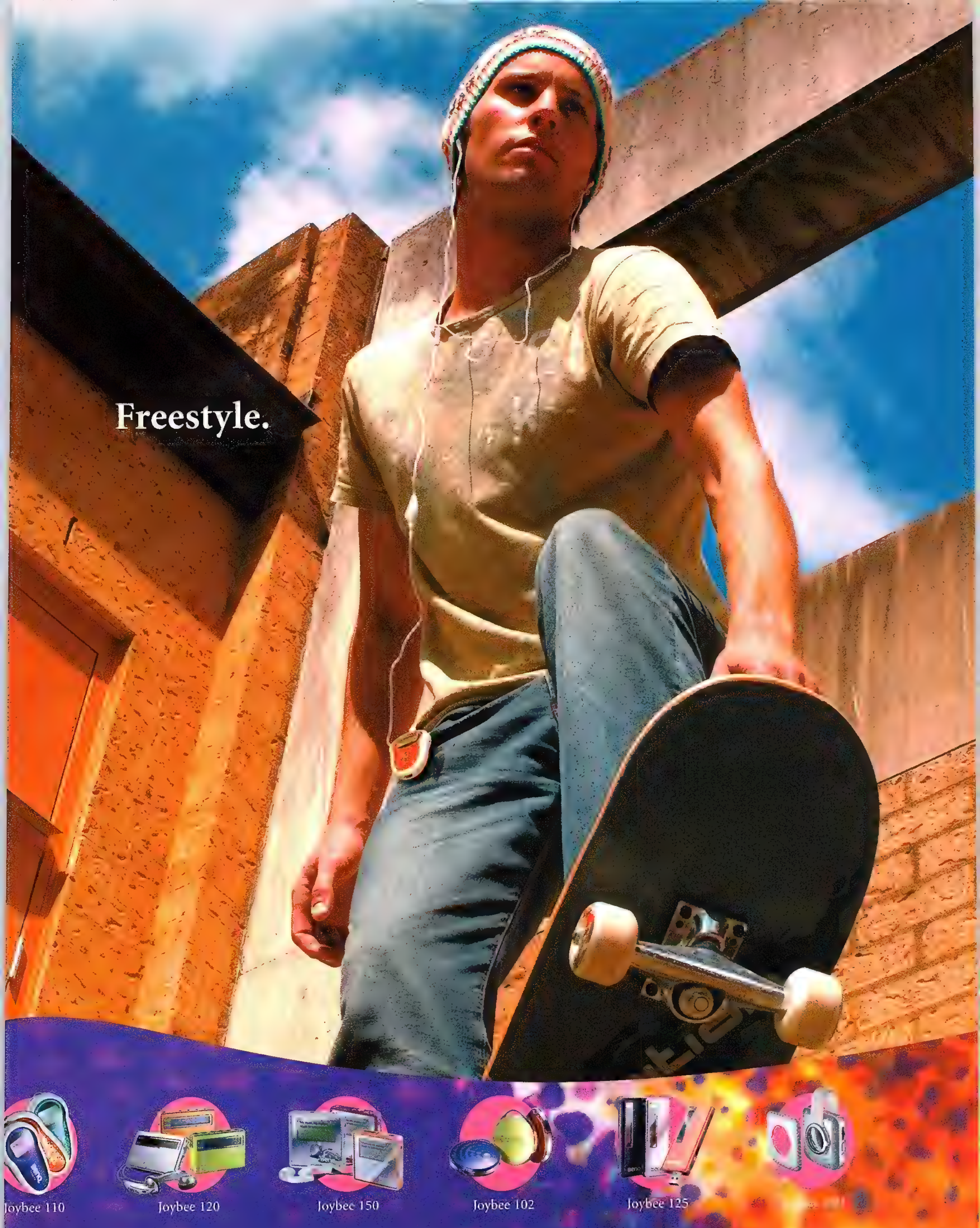
Come join the combustion at www.atomicmpc.com.au/forums.asp. When the smoke clears, you'll find it's friendly fire.

Virt

POTM 41

Image. Context. Fear.
www.atomicmpc.com.au/forums.asp?s=1&c=1&t=35952
By Gramyre

Atomic has a wonderful history of threads such as this month's winner. Intelligent analysis and debate about a hot topic. It brings out the best in Atomicans. It showcases a variety of opposing viewpoints, of different angles, of personal views. Image. Context. Fear. Has tackled a hot potato, and done so with style and wit.



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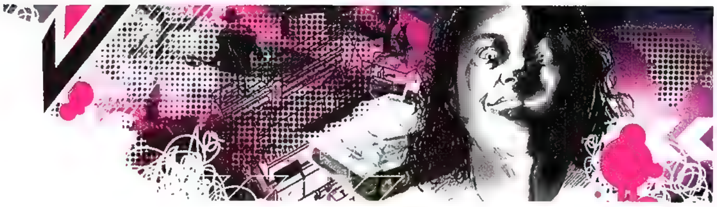

It's SnitchCam time!

Daniel Rutter drives you through the future tech on our roads that could use good beams to catch bad beamer-drivers.

Ubiquitous video surveillance used to be science fiction; now it's a real civil liberties issue. If you're a politician who's decided to bang the law and order drum, it's now hip to promise surveillance cameras all over the place. It's cheaper than the traditional promise to draft every second citizen into the police force, especially if you don't actually hire anybody to watch the camera feeds.

But miserable zero-privacy Orwellian societies can't be created purely by the efforts of right-wing crypto-fascist governmental bureaucracies (man). They require the cooperation of citizens who are eager to turn in their neighbours and relatives in return for a reward.

Technology will soon offer a new and exciting way for people to be gleeful, vindictive snitches. Or, by using the exact same tech, fearless opponents of governmental oppression.

This is how it's gonna go down.

Lots of private citizens own camcorders today, but they don't generally walk around recording constantly all day on the off-chance that something exciting might happen.

Technology to the rescue! Already, you can buy cheap micro-camcorders that run from AA batteries and record onto increasingly cheap Flash memory cards. They can store hours of low framerate, VHS-resolution-at-best video on one card.

These gadgets are great toys, and somewhat useful. They can't compete with regular camcorders for image quality, but I know which one I'd rather strap onto an R/C aeroplane.

Solid state camera lenses are going to get better, as is their sensor resolution, framerate, and price per hour of video capacity. And they're going to get smaller.

It's already possible to install a digital still camera of highly questionable quality in a pair of Buddy Holly sunglasses. A 25 frame per second, 640 x 480 video camera with 24 hours of storage is not at all out of the question in a few years.

If it's OK for the gadget to be the size of a pack of cigarettes, we'll be seeing them even sooner. A camera module that size will fit nicely behind the rear vision mirror of a car. Hold that thought.

Tiny-cams will be sticking with local storage for the time being, but there are more than a handful of long-range wireless internet access technologies out there already. I won't be surprised if the only local storage in many digital cameras 10 years from now is a bit of buffer memory.

Remote storage won't just be a convenience feature. It, plus some suitably durable encryption, will make these cameras real agents for social change – one way or the other.

You've got a button on your steering wheel, with which you can tell the camera to squirt the next half hour, and the last half hour, out into the ether for examination at SnitchCam Central.

See, I have this idea. I call it the SnitchCam. It's a camera that looks out through the windscreen of your car – like the ones mounted in some police cars already – and records everything that happens. Maybe it's got a tonne of local storage, maybe it's just got a rolling one hour buffer.

You've got a button on your steering wheel, with which you can tell the camera to squirt the next half hour, and the *last* half hour, out into the ether for examination at SnitchCam Central.

If your video clip shows someone doing something for which they should be booked, they are. And if they end up paying a fine, you get a cut.

(If you try to Fight Da Powa by submitting numerous clips of nothing/your dog/your naked body, they'll take your SnitchCam away.)

SnitchCams probably wouldn't be any good at catching speeding motorists (I'm happy to say... for no particular reason...), because only quite drastic speeding is obvious merely from video footage. Accurate mobile speed-gun work requires radar, and integration with a well-calibrated speedometer, which regular consumer automobiles usually don't have.

Various forms of dangerous driving, though, should be quite clear in SnitchCam footage. With adequate image resolution, framerate and cryptographic protection of the data, righteous vengeance will be wreaked upon automotive menaces of all kinds.

That's small potatoes, though.

An open SnitchCam-ish system – with footage sent in realtime to as few or as many people as you like, anywhere in the world – could be a real force for good.

Right now, it's hard to prove that (for instance) riot police really beat the crap out of innocent people at a demonstration. Current camcorders are too obvious, and too fragile; they and their operators become targets.

The evidence from one video camera can be pretty flaky, too. Careful editing can transform violent anarchists into innocent victims, and vice versa, and that's *before* you start thinking about near-future Pixar-on-every-desk computing power letting people create their own realistic videos from scratch.

Live streaming video from multiple cameras operated by lots of people at the same time, though, will be a different matter. Even without cryptographic jiggery-pokery, it'll be practically impossible to get away with even minor editing-room spin doctoring if thousands of people around the world have the original footage on their hard drives.

If at least two cameras are looking at a given event and lots of people can receive the broadcast, faking something up suddenly becomes about as easy as faking the Moon landings.

Don't ask me what Sweeping Social Changes will be caused by SnitchCams; my ability to foresee techno-consequences stops at the certainty that it's a bad idea to let anyone called Brundle near a teleporter. I just look forward to life getting difficult for 318i drivers with mobile phones on their ears who change lanes without indicating.

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Time to act

Fond of your freedoms? Read this, act upon it, and you may just keep them. Ashton Mills issues a call for action.

In the United States in 1998 the Digital Millennium Copyright Act (DMCA) was made law in an attempt to protect intellectual property holders in the emerging digital world. While for the most part the DMCA is representative of necessary change, certain sections are so loosely worded that they are open to abuse. At the time this caused a significant uproar from those fearing misuse of the DMCA, but it was made law nonetheless. Five years later the track record of DMCA abuse has proven these fears were well grounded.

So far the DMCA has been used, beyond its intention, to silence scientific research, cull fair use, impede competition and innovation, prevent viable reverse engineering, and make criminals out of average consumers. And, not surprisingly, it's almost always in the name of multinational corporations.

Some of the more notable examples include Princeton Professor Edward Felten and his team who, in 2001, were silenced from sharing an academic research paper on the design of the digital music protection scheme SDMI (Secure Digital Music Initiative) which, in a bitter twist, the breaking of which was issued as a challenge by the SDMI authors. In response to the threat, the paper was withdrawn.

Also in 2001, Russian programmer Dmitry Sklyarov was imprisoned for five months in the US after Adobe-sponsored lawyers alleged he had broken the anti-circumvention sections of the DMCA. Dmitry had helped write software to read Adobe's protected e-book format. While the tool has many legitimate uses, Adobe was having none of it and went after Dmitry's employer ElcomSoft, which was eventually acquitted after an 18 month hearing.

Then there's DeCSS and the freedom of the press – all the weight of Hollywood came down on *2600 Magazine* citing the DMCA censored it from even referencing DeCSS as the source of a program that breaks the DVD encryption mechanism. Despite *2600* not writing the software, or using it for copyright infringement, it was silenced.

Microsoft even brought the DMCA to bear against Slashdot (now that's *one* way to pick a fight with the world's geeks) after forum posters allegedly republished part of Microsoft's Kerberos specification even though the company itself had publicly published it through a 'click-wrap' agreement.

Recently Apple used the DMCA to force SourceForge to take down the PlayFair project, a simple program that makes it possible to remove Apple's FairPlay DRM from music files. While Apple's DRM isn't too bad, the bottom line remains that you can only play iTunes-purchased music files on DRM enabled devices such as the iTunes software and iPods. You are not free to use the music you have bought on any device of your choosing, even though you own a legitimate copy of the music. That is, unless you use PlayFair.

> The DMCA has been used beyond its intention, to silence research, cull fair use, impede competition, prevent reverse engineering, and make criminals out of average consumers.

Speaking of fair, in America there is an explicit fair use exemption to copyright law to enable the public to use copyrighted works for noncommercial and personal use as well as for comment, news reporting, teaching and research. The music labels of America, in a misplaced attempt to 'curb piracy', have started releasing copy protected CDs. Sony claims 11 million already in circulation, with the majority of all CDs from all labels expected to be protected within the next few years. Under the DMCA, circumvention of this protection – even if to use the work for personal fair use – is a crime. Ergo, copying the CD to your portable MP3 player makes you a felon. Such protected CDs are already on sale in Australia (Radiohead and Red Hot Chilli Peppers latest albums are two examples).

Speaking of Sony, it has so far used the DMCA as a bludgeon against mod-chip manufacturers to prevent gamers from playing imported games, and invoked it against an Aibo hobbyist who developed his own programs for the pet robot. Only after a public outcry did Sony get the message and retract its assault.

Seemingly following suit, Blizzard has used the DMCA against the developers of 'bnetd', a free and open source and alternative to Battle.net allowing gamers to play Blizzard games with each other over the internet without requiring they go through the sometimes problematic Battle.net. Yet another great example of how to alienate your customers.

So what's the big deal? Well, now all of this is coming to Australia. The recent AU-US Free Trade Agreement includes a chapter that applies DMCA-like provisions to our own copyright and patent law. It is, without a doubt, largely pressure from corporations like the RIAA and MPAA to enable them to pursue the same litigation practices against Australians here in Australia. Understand this: it's possible you will lose some of the freedoms you take for granted over the way you choose to use the products you buy.

It would make it illegal to use programs to copy protected music and DVDs for personal use, make you a criminal for wanting to play imported games on consoles, threaten the development of open source software, unnecessarily grant extended benefits and powers to copyright holders (the beneficiaries of which would be mostly multinationals), and create new powers to pursue litigation including forcing ISPs to provide information possibly without any judicial approval.

So what can *you* do to prevent this? Read Roger Clark's excellent summary here: www.anu.edu.au/people/Roger.Clarke/II/FTA17.html search on 'FTA' at www.efa.org.au, sign Linux.org.au's online petition here: www.petitiononline.com/auftaip, and write to your local MP and politely let them know your concerns. It's cliché, but true: you get the government you deserve. So make yourself heard.

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Two cores are better than one

Like some kind of two headed monster, Tim Dean contemplates the good and bad of multicore processors.

It's a big number: 410 million. Not the biggest number ever, but it's big. By comparison, it has nine digits, while the largest known prime has around 11,277 digits. Given that, 410 million is still big.

It's about as many breaths as the average person has in 52 years. It also the number of years that have gone by since the Upper Silurian age in the Palaeozoic era – which also makes it the best part of an eon.

And 374mm^2 is a small area. Not the smallest area ever, but it's small. As it happens, the smallest theoretical area, known as a quanta of area, is calculated to be in the ballpark of 4.39444 times the Plank area (which is about 10^{-70} square metres) – and it also turns out to be almost bang on four times the natural log of three. What are the odds eh?

Still, 374mm^2 is small. By comparison, the area of Australia (not including islands – blame the Liberals for that) is about $7{,}659{,}861{,}000{,}000{,}000{,}000\text{mm}^2$. So, you'd fit about 20,480,911,764,705,882 of your 374mm^2 areas into Australia. That's a lot. In fact, that's even more than 410 million of them.

The point is, we're playing with some very large numbers here, and so too are the crazy bunny-suited scientists who create CPUs. 410 million just happens to be the number of transistors in the upcoming Itanium 3 processor, and 374mm^2 is also coincidentally the size of the die (as I said before, what are the odds?).

The reason there are so many transistors to play with are multifarious. Materials have improved dramatically over the last decade or so. Techniques like strained silicon and Low-K dielectrics have reduced things like electron leakage and resistance. This leads to a reduction in the amount of energy that is wasted as well as the amount of heat generated.

This is good, and is pursued mainly in the name of speed. The higher the frequency, the more power is flowing through the transistors, and the more heat is potentially generated that then needs to be dissipated. Conversely, the lower the heat, the more mojo you can pump through, and the faster the transistors can be allowed to switch.

One side effect of all these smaller and cooler parts is you can pack more stuff onto a chip. So, what do you do with all these bits and pieces? One thing is improve the architecture. But you don't want a bloated architecture – you want to try to keep things as streamlined as possible, even in a multipurpose processor. OK, what else can you do with all those transistors?

> We have processes shrinking, materials improving, power consumption down, big-arse dies and we're nearing the elusive one billion transistor mark.

Memory takes up a lot of transistors, and poor latency and bandwidth can be a huge bottleneck to performance. Because of this it makes perfect sense to cram your processor full of as much cache as you can.

In fact, this increase in cache size often comes at very opportune times, such as with the Prescott. The Prescott saw another extension to the pipeline, and that means increased risk of mispredictions. When that happens, you need to stuff the pipe full of the good stuff again before things grind to a halt. HyperThreading also digs its cache. Running multiple threads simultaneously is tops, but when you have two threads badgering the cache at the same time, it can end in tears.

Then again, there's a point where masses of cache will not benefit all applications, and you can't justify the cost of adding it in. So what else to do with all those transistors?

And that's where we are today. We have processes shrinking, materials improving, power consumption down, big-arse dies and we're nearing the elusive one billion transistor mark. We're also seeing a shift in the computing model where improving performance in single applications is not as important as making sure you can run multiple applications seamlessly and without slowing either down.

Enter the dual-core CPU. It's a surprisingly simple concept – you basically have two CPUs on one chip. Ace. So, what's the benefit?

We already know that multiprocessor systems are pretty cool. Workstations and servers have been using them for yonks. Desktops haven't really got stuck into the multiprocessor frame of mind because of the way they're used, but that's changing.

When you're talking about multiple CPUs, you're talking about running more than one thing at a time – so unfortunately it doesn't really help if you're just running one app, like a game, unless that app is built to utilise the CPUs. It's also hard to make a single app properly use multiple processors as you have to be able to split up the workload into two complementary workloads that won't end up fighting or dilly dallying when they're flying through the CPUs. As such, things like 3D renderers work, but games don't.

The thing is, we're about (like in five years or so) to enter a world, especially at home, where your PC is servicing more than one person or application at a time. You might be playing a game, but your PC might also be recording a digital TV broadcast through your DVR (digital video recorder) software, and also streaming music or a movie over wireless to another point in the house. This is all wiggy future stuff now, but it's bluchastically close to happening (no, that's not a word – I couldn't find one that accurately represented the concept of 'arm wavingly schlombastic' so I made one up).

Intel has already talked about the Montecito, the dual-core Itanium, and the Tulsa, the dual-core Xeon, and AMD has stated that the AMD64 architecture was designed from the ground up with dual-core CPUs in mind. This means the technology will be hitting the high-end soon, and it'll trickle its way down to us shortly thereafter. That makes me happy.

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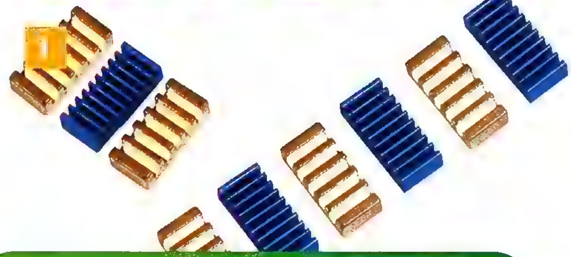
GEARBOX



1 Thermaltake RAM sinks

Supplier: Anyware
Website: www.anyware.com.au
Phone: (07) 3856 3999
Price: $15 (copper); $12 (aluminium)

RAM sinks are crazy things. To thwart misconceptions, they do sweet-FA for performance and there is no difference between the elements. Memory modules simply aren't affected by heat in the same way that chips that actually process the data, such as chipsets and CPUs/GPUs, are. No matter how much you cool them, they don't perform any better. We tested with the Leadtek FX5700 in this month's Framerate and couldn't overclock 1MHz further than we already had. Basically, RAM sinks are just for looks.

2 Antec Aria

Supplier: Altech
Website: www.altech.com.au
Phone: (02) 9735 5655 **Price:** $195

Larger than the standard small form factor case, this box, with a collection of four expansion slots out the back, was created for Micro ATX mobos. Its simplistic design makes it a winner, with easy access to all areas and ingenious side/top panels that use clips, all contained within a sturdy housing. One problem is the PSU's a little low and makes it harder to install a board with vertically aligned audio ports. There's no real concern for exhaust, as the silent 120mm PSU fan performs the job and an expansion slot exhaust fan is also included. Equipped with a juicy 300W, this is a brilliant and affordable Micro ATX case.

3 Global WIN ATX SAF450 PSU

Supplier: COM-TEK
Website: www.com-tek.com.au
Phone: (03) 9329 2388 **Price:** $179

The innards of PSUs aren't the first thing you look at for sexiness, but the tinted blue windows on this chromed angel are slightly arousing. What makes this otherwise ordinary silent PSU different, apart from two SATA plugs, is it continues to power set fan lines for three minutes after system power down. This will remove heat faster, but as the components are not going to heat up any further (the slight increase in temp is heat coming to the surface), that's pointless. However, it *is* superbly quiet and as the intake fan is on the rear it will function in any tower case, upside down or otherwise.

4 Gigabyte Expand Box

Supplier: Synnex
Website: www.synnex.com.au
Phone: 1300 880 038 **Price:** $29

If you haven't already made use of all your mobo's on-board connectors, this is for you. It's a basic product – simply a series of passthrough lines (two USB, two FireWire, line out and mic) that neatly plug into the assigned array of pins on your mobo, all set into a plastic 3.5in box. It's all handy-dandy and will make sure you're using every available triangulated cubic nanometre of your box, and is especially handy if you worry about developing skeletal deformities from reaching around the back of your PC to swap USB and audio plugs. Another useful gadget to ditch the floppy drive for.

5 Sony PS2 SingStar

Supplier: Sony Computer Entertainment
Website: www.playstation.com.au
Phone: Sony 1300 365 911 **Price:** $99.95

With pop idols emerging at a frightening pace, PS2 has created not only a ruthlessly judgemental vocal challenge but a tool for the masses. EyeToy compatible, Singstar provides a spotlight for rock star wannabes, grading skills of rhythm, pitch and tone. The track list covers everything from Madonna to Roy Orbison and, with a dual microphone set, Singstar caters for the duet in us all. Recording all sound from the moment the music starts, improvisation is essential and voice alteration an hilarious option.

6 Acing USB Docking Ball

Supplier: PC Case Gear
Website: www.pccasegear.com.au
Phone: (03) 9584 7266 **Price:** $11

Well, things don't get much more USB-noveltyish than this half-a-golf-ball gadget. It's simply a USB 2.0 extension cable with one end weighted and shaped into that of some lethal sports projectile with an unintelligent bright green LED light that simply stays on. What bothers us is why there's only one USB port. Sure, it's a docking *ball*, but for crying out innovation, how about giving us additional jacks? It's simply a 1.2 metre extension cable without any trippy circuitry inside. Grab one if you have a fetish for diced golf balls or USB cords.

7 Thermaltake Xaser V Wingo

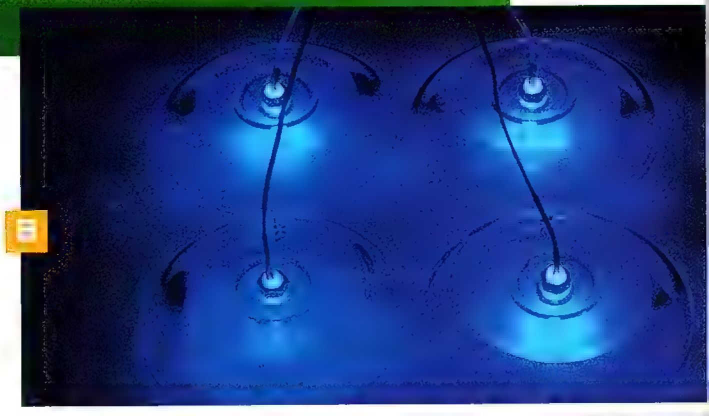
Supplier: Anyware
Website: www.anyware.com.au
Phone: (07) 3856 3999 **Price:** $249

Thermaltake has discovered the alchemists true dream of how to fuse plastic and aluminium to formulate an uber-alloy we at *Atomic* have dubbed 'plastinium', to which this case, naturally, lives up to. A neat array of clips is used to hold expansion cards in and also clips for the 5.25in drives, but otherwise it's choked with design flaws. The lovely window on the side blocks any decent amount of fresh air from passing through the two side fans (the front intake is also blocked). There's no sliding mobo tray and the front door is flimsy.

8 iCute i-Stand

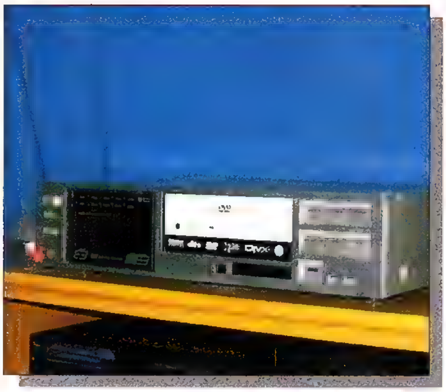
Supplier: PC Case Gear
Website: www.pccasegear.com.au
Phone: (03) 9584 7266 **Price:** $19.50

Available in primary colours, these sizeable round discs attach to the base of practically anything with feet, like your machine, and light up all pretty-like when fed a Molex line. If big feet rock your joint – and they do tend to indicate you have some serious kit – then by all means keep it shakin'. Well made and fairly easy to install (though the rear mobo end was fiddly) the feet are a little generous. The edges touched on our stock medium tower case. Ensure you have room for a diameter of 12cm around the foot holes, otherwise, like many LED mods, useless but cheap and pretty(-ish).



Hotbox

Dave's HTPC



Technical details

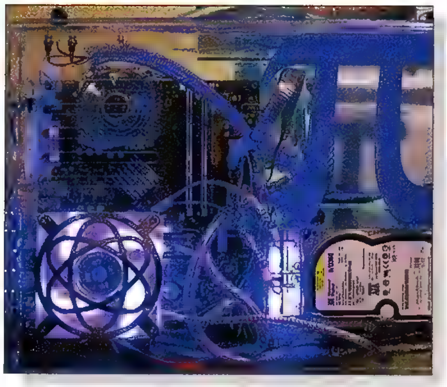
- AMD K6-III 450MHz
- 96MB RAM PC133
- Onboard video/sound
- 10/100 NIC
- 2.1GB hard disk drive
- Real Magic Xcard
- 16x DVD-ROM
- Old amplifier case
- Windows XP
- Joveplayer
- Can play MPEG1/2/4 and MP3s/DVDs/VCDs and SVCDs

After seeing a HTPC in a previous edition, I've always wanted to do one myself. The first step was to find a suitable case. I took the PSU out of the case and used that as a basis for height. After rummaging through old equipment around the house I finally found one that fit – an old amplifier case that began gutting immediately. After this I did some measurements and started cutting the case with a Dremel. 40 or so Dremel cutting blades later and the back panel was cut. After installing the mobo and PSU, I made measurements to cut the holes in the front for the DVD-ROM and remote sensor.

Once they were completed the HTPC was nearly finished. All I needed now was a riser card to install the Xcard on its side. After purchasing one the HTPC was done.

Eventually I want to paint the DVD-ROM to match the case. While the specs for this HTPC are low, with the help of the Xcard it can play MPEG1/2/4 and MP3s/DVDs/VCDs and SVCDs.

Euclid 2



Technical details

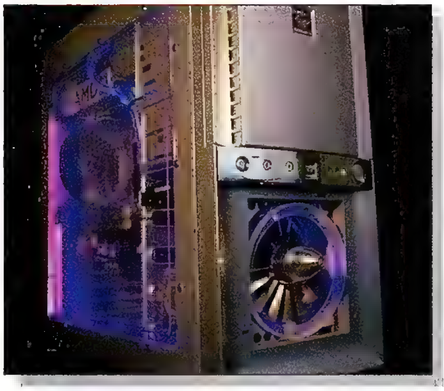
- All clear Lucite body
- Atomic/Playboy thumb-screws
- 40mm, 80mm, and 120mm LED fans
- Case feet on bottom and back
- Handle for easy carrying
- Skull & wings applique
- Atomic fan grilles
- Door has hinges for easy access
- Silver 'duelling dragons' on rear
- UV reactive PSU cover
- Blue hard drive activity LED mounted on the HSF

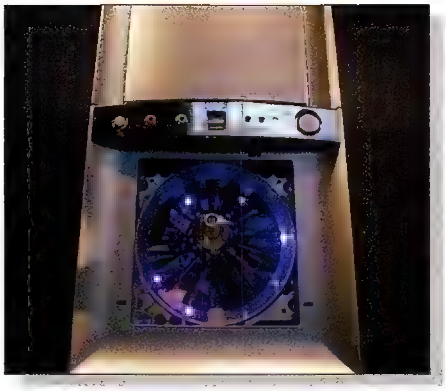
This is the Euclid 2, the design was inspired largely by the movie *Pi*, but unlike the black and white film I wanted something with lights and colours.

The case is a ClearPC, model 'Secret Agent Briefcase'. I had experimented with various window designs, but having a completely clear enclosure allowed me to appreciate all the individually picked parts at all times.

The system specs are the following: an AMD 2500+ Barton CPU cooled by a Swiftech 462 heatsink; 1GB Corsair PC3200LL RAM; ASUS A7N8X mobo; Sapphire 9700 PRO Ultimate graphics card; Western Digital 36GB Raptor SATA HDD and 120GB with 8MB cache ATA100 HDD; Pioneer 4X DVD-R burner; Cooler Master 'Muskateer' fan controller; 500W PSU modded by FrozenCPU; *Atomic* and Playboy bunny thumb-screws. Also I put case feet on the bottom and back of the case, so it can function as a tower or a desktop.

Felipe's FX LAN BOX





Technical details

- AMD Athlon FX-51 overclocked to 2,376MHz (from 2,200MHz)
- PowerColor RADEON 9700 PRO overclocked to 350/360MHz
- 1GB dual channel DDR400 ECC RAM 2.5/3/3/8
- ASUS SK8N motherboard
- 2x UV cold cathodes; 8x UV LEDs; UV rounded IDE cables
- 16-blade 4-in titanium impeller
- Zalman CNPS7000-Cu HSF
- Zalman NB32J nForce3 cooler
- Pioneer DVD, SONY CD-RW

Thanks to AMD for the FX-51 system that I won back at the AMD launch, I had a good starting base for a Hot Box.

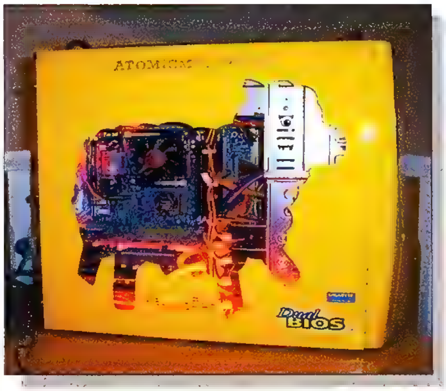
All things being *Atomic*, I just had to improve upon it. I overclocked the FX-51 to 2,376MHz and I fitted a 9700 PRO from my previous system. I replaced the case with a SuperLANboy because it's smaller, lighter and sexier than the beige box that the system originally came in.

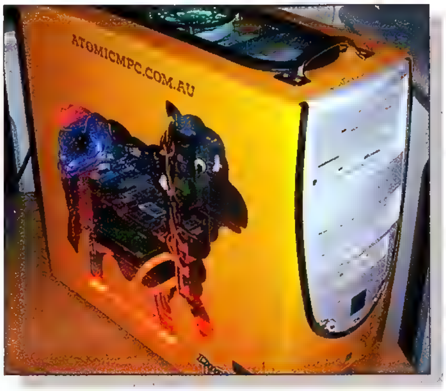
A friend of mine, who works in the aviation industry, gave me a titanium helicopter impeller blade about two years ago, this is the highlight of the case. A custom mounted 50 amp motor rotates the blades at an estimated 15,000 rpm finger chopping speed.

Other features include blue anodised thumbscrews, UV cathodes and ultra violet LEDs surrounding the turbine intake at the front. A discreetly displayed *Atomic* sticker and AMD logos are mounted on the interior.

Also, thanks to Lancer2K for the modding assistance.

Lambo's Baahbox





Technical details

- Intel Pentium 4 2.53GHz @ 2.8
- 512MB PC2100 DDR
- Gigabyte GA-8INXP
- PowerColor RADEON 9800 PRO
- 4x 120GB Western Digital in RAID0
- 80GB Western Digital
- Pioneer 107 DVD writer
- Lite-On CD-writer
- Pinnacle TV tuner card
- Creative Audigy 2
- Thermaltake 420W PSU
- Yellow automotive paint
- Googly eye

I like sheep. And if you recognise the name from the forums, you'll immediately recognise this one as mine.

My first case mod was a little plain, the same old windows, lights etc. So it was obvious when I started this case mod that it had to be something special, something individual, and something of the sheep variety.

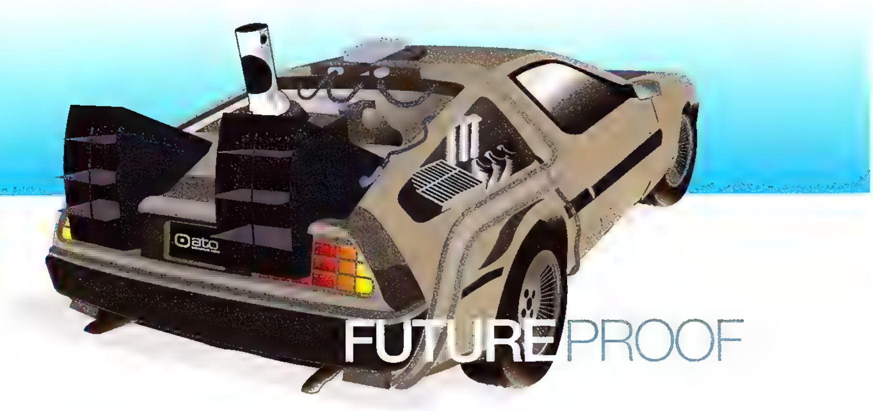
The most difficult part was cutting the shape of the sheep out, as the pattern was quite intricate and seeing as I didn't have a dremel; the jigsaw was the next best thing. Next, it was off to the automotive painters for a new paint job. They had an old tin of yellow, so that's what it got. After adding the essential lights, neon fans, and handles to the top, the final touch was the googly eye for that extra detail. And hey presto, the Baahbox was born.

Hotbox of the month wins the Leadtek Winfast K7 NCR18D!

Vote for this month's hottest Hotbox at www.atomicmpc.com.au. Voting closes 16/06/2004. Send your Hotbox pics and 200-word description to *hotbox@atomicmpc.com.au.*

- Leadtek Winfast K7 NCR18D
- nForce2 Ultra 400

'It's a bit of alright.'
Nathan Davis



Damn versatile dyes

Sometimes 4.7GB of space isn't enough. The next generation DVD+R almost doubles the storage space and John Gillooly explains how.

Affordable DVD burners have been a boon to data hounds, allowing much more efficient backup of pron collections worldwide, however the niggling question of whether 4.7GB of space is enough just keeps popping up. Well thankfully, Sony is soon to introduce the first burner to support the new DVD+R 9 specification, which uses dual-layer technology to deliver 8.5GB of storage.

Developed by Philips, DVD+R 9 (also called DVD+R DL) is designed to be backwards compatible with the DVD-ROM 9 standard for dual layer discs. The benefit of dual layers is that the storage capacity for the disc can be doubled without needing to turn it over, but to attain such a feat Philips and Japanese media manufacturer Mitsubishi Kagaku Media (MKM) combined to design the standard.

Mass produced CD and DVD discs are based around a glass master disc, which has the data etched onto it in a layer of photoresist. This master is then used to make an imprint of the pattern onto acrylic blanks. Then the pattern is coated with a reflective metal layer which allows a laser to read the data during playback.

Normal DVD+R discs are based around a polycarbonate sandwich, inside of which lies a reflective layer covered by a translucent dye layer. When burning a DVD, the laser heats the dye in a pattern, which becomes opaque. This then blocks any reflection from the heated areas, enabling the disc to be read in most players.

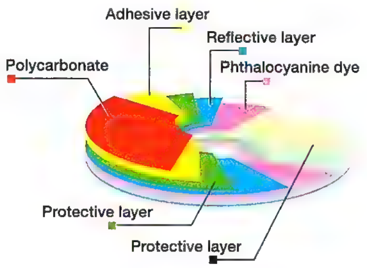
But this creates a quandary for dual layer DVD burning. Because the laser cannot penetrate the metal layer, some tricks were needed to develop a standard that was both high capacity and able to work in most players. To do so Philips teamed up with MKM to develop new dyes and techniques.

What the team did was to ensure that the current metal layer was as reflective as possible and then added a second layer of dye over a translucent metal. In between this is a 55 micron thick spacer that keeps the two layers separate.

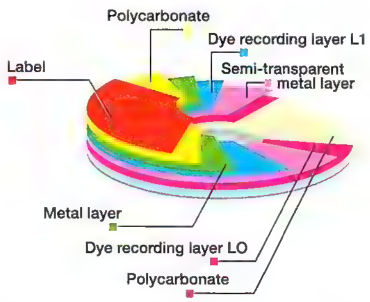
In order to burn DVD+R 9 discs the focus of the laser changes when swapping between layers, essentially blasting through the translucent metal layer when it needs to read the underlying one. The reading of the data is then the same as with existing pressed DVD 9 discs, allowing it to be played back in a variety of machines.

Sony's burner, the DRU700A is to be the first of the burners to support this new format, with many more on the way. Unlike the highly expensive, and proprietary blue laser based format that Sony also supports – Blu Ray – the DVD+R 9 format is designed for mass consumer products and already has disc manufacturer support ready to go when it launches. JG

Layer upon layer



Above: A normal DVD+R disc (label side up) has a phthalocyanine dye which heats up when hit by the laser.



Above: DVD+R 9 discs use a semi-transparent metal layer to focus the laser beam onto the two dye layers when writing.

Better > faster

With new technology about to emerge on the desktop John Gillooly looks at how performance is no longer king.

Serial ATA gives no tangible boost in performance. It's a testable fact, and something that was quite openly talked about in the lead up to its launch. Sure, it opens up new opportunities for desktop performance – like Western Digital showed with its 10,000rpm Raptors – but the standard 7200rpm HD still can't pump data through fast enough for ATA100, let alone SATA.

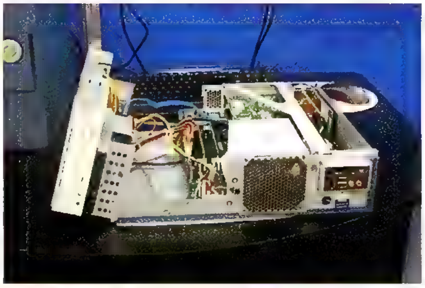
This led to a marketing nightmare, as performance is seen as the be-all and end-all of new hardware. It is a better solution for so many reasons, but better does not sell anywhere near as well as faster.

A technology designed to last 10 years or so needs enough headroom to take full advantage of future performance leaps. This translates to no noticeable performance difference in the short term, but it removes

Right: A 2GB DDR-2 memory module.

impediments to future advances in technology that by their very nature are unknown to us at the moment. If we extend the hard drive example, at one time advances in hard disk access and rotation speeds required a new hack of the Parallel ATA specs to allow enough bandwidth to complement the speed boosts. However, if such an advance were to happen today, pushing drive access above the approximate 100MB/s transfer limit of 7200rpm drives, this would not require a new standard to be developed. Instead the headroom already built into the 150MB/s transfer speed of SATA could come into play and the transition to faster drives could happen much faster than it traditionally did.

Below: Intel's new BTX form factor relies on tech like SATA and PCI-Express.



With the impending launch of PCI Express comes a slight twist on this situation. Whereas in the ATA world the drive is the bottleneck, in the 3D graphics world it has always been the bus itself. Even though AGP was a quantum leap over PCI, 3D graphics chips are phenomenally bandwidth hungry, which is why there is a need for big onboard frame buffers. If we look at the numbers, AGP 8x is capable of a unidirectional memory bandwidth of 2.1GB/s and x16 PCI Express delivers 4GB/s of bandwidth in each direction. In contrast, NVIDIA's GeForce 6800 interfaces with its GDDR3 memory at 35.2GB/s.

This order of magnitude increase in available bandwidth means that offloading any memory operations to system memory won't even enter a game developer's mind – it simply provides too much of a performance hit. What PCI Express does facilitate are operations like video in which the bidirectional nature of PCI Express becomes important. ATI has demonstrated this benefit quite effectively in a demo of realtime HD video editing, in which there needs to be 400MB/s of bandwidth available in each direction.

Like SATA, this means that there is no performance advantage that comes from moving to PCI Express; like SATA, the benefits lie elsewhere.

What PCI Express does bring to the table is much slicker overall system design. Unlike the hub-based architecture of PCI, PCI Express runs through a switch, which eliminates the horrible choking of data that happens on the PCI bus when multiple devices try to access the CPU and RAM. This allows full 2GB/s speeds to be squeezed out of Gigabit Ethernet and also paves the way for running multiple TV-Tuner cards within a system for true personal video recorder (PVR) functionality. But more importantly, it's a technology designed to be capable of rapid adaptation to future technologies.

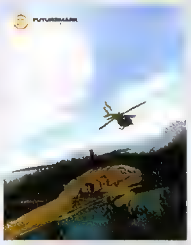
Perhaps the only big impediment to the uptake of PCI Express will come from associated technologies. At the time of press we were expecting the launch of Intel's Grantsdale and Alderwood chipsets to happen during the first week of June, at Taipei's Computex show. Once these chipsets launch we will see the first examples of PCI Express graphics cards as well.

With Grantsdale and Alderwood Intel is aggressively introducing new technology. The chipsets will not support AGP slots at all – graphics will have to be PCI Express – but more interestingly they will not support DDR RAM. Rather they'll require DDR-2, which will initially be much more expensive than DDR400, and, thanks to increased memory latency inherent to DDR-2, indications are that there will not be a tangible increase in performance until DDR-2 667 memory launches next year.

At the moment a lot of this is still theoretical and it will not be until proof arrives in the form of Alderwood and Grantsdale hardware that we will see what impact DDR-2 will make. Unless HD video editing floats your boat, be prepared that PCI Express will not be faster, but rest assured that, just like Serial ATA, it will be intangibly better and a much more robust solution for the future. JG

ShortCircuits

◀ Benchmarking is finally coming to a mobile phone near you. Now that OpenGL ES has emerged as the dominant standard for graphics hardware on mobiles, Futuremark is readying a new benchmark to test just how grunty the new mobile graphics chips will be. While details are still sketchy, it will be targeted at phones using either version 6 or 7 of the Symbian operating system, and as you can see from the screenshot, it does not pull any punches in terms of graphics detail.



◀ Xerox has developed a method of printing plastic transistors that could work with an inkjet printer. The method uses a compound known as Polythiophene to make a nanoparticle-laden conductor which, when combined with ink-based semiconductor and dielectric material, can create the flexible transistors. And Xerox believes it can be done at room temperature, unlike competing technologies which need high temperature, high pressure environments to print. This technology could be used to make flexible displays using electrophoretic ink as well as providing a cheap means of creating RFID chips, according to the company.

◀ Just when the world thought that the PowerVR name had faded into obscurity, Imagination Technologies has announced the licensing of its Mobile PowerVR MBX technology to Intel. Based around the OpenGL Embedded Systems (ES) 1.0 specification, the PowerVR MBX core will power Intel's new 2700G mobile graphics chip. The 2700G was announced at the recent Taipei Intel Developers Forum, and is designed to complement the new XScale processor core to create the mobile gaming platform that Intel first touted at last year's Fall IDF. The 2700G will make its first appearance later this year in a mobile phone near you.

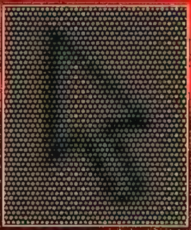
Display technology

For some reason, we still don't have jacks in our necks that allow us to directly perceive the video output of our precious, precious computers. So, regrettably, the beautiful 32-bit pixels must at some point become filthy, nasty little photons. Here's how, explains Daniel Rutter.

CRTs

As small ancient lizards evolved into dinosaurs, so too did vacuum tubes beget Cathode Ray Tube (CRT) monitors.

Vacuum tube technology is simple enough, in essence. Put two terminals inside an evacuated vessel, pump electrons into one terminal and connect the other to ground, and you'll get electron flow through the vacuum.



ABOVE: In close-up, CRT images are amazingly fuzzy. But do you really *need* to see the corners of your pixels?

CRTs use this phenomenon to display colour images by magnetically squishing electrons into three separate beams, and magnetically steering them so that they paint a screen covered with red, green and blue phosphor splodges. The phosphor lights up when the electrons hit it.

A shadow mask (perforated metal) or aperture grille (lots of tiny vertical wires) prevents phosphor of one colour from being hit by electrons intended for another colour.

✓ CRTs are good because:

☐ They're cheap for the screen area you get.

☐ They're the same colour and brightness no matter what angle you view them from (within reason).

☐ They respond fast when the image changes. This is relatively unimportant for most desktop PC tasks, but a big deal for games and movies.

✗ CRTs are bad because:

☐ They're bulky and heavy.

☐ They're susceptible to outside magnetic interference. If interference bends the electron beams a little bit, they hit the wrong phosphor dots. This is why weak magnetic fields make CRT images go funny colours, but don't greatly distort the picture.

☐ They're hard to set up. Most CRTs these days have a dizzying suite of geometry adjustment features, to compensate for outside magnetic fields, as well as to just get the particular output of your video card to fill the screen neatly. Many CRT owners, though, never set the refresh rate high, much less tweak pincushion and trapezoid settings.

LCDs

The modern active matrix Liquid Crystal Display (LCD) monitor is a very attractive alternative to a big fat CRT.

In an LCD, the pixels don't actually glow. Instead, every pixel is composed of three 'subpixels', which have red, green and blue colour filters sitting between the outside world and the white backlight inside the panel. The backlight is what does the glowing.

ABOVE: Sharp enough for you?

Each LCD subpixel has a liquid crystal shutter that can block varying amounts of the backlight's output. Active matrix screens have one tiny thin film transistor for each subpixel; getting every one of the millions of transistors on a screen to work right is a major manufacturing challenge.

When a subpixel shutter's all the way on, the subpixel is as close to black as it'll ever be. When the shutter's turned completely off, the subpixel lets lots of light through, and glows as brightly as it can.

✓ LCDs are good because:

☐ They're slim and light. The desk space saving isn't likely to be very important (most LCD owners don't actually keep a lot of stuff behind the screen...), but you can hang an LCD on the wall, and you can carry it upstairs without herniating yourself.

☐ They use less power. Maybe 30 watts for an LCD, versus at least 100 for a good-sized CRT. Not a huge difference in electricity-bill terms, but every little bit helps, especially if you're trying to keep your house cool in summer.

RIGHT: The Optoma H30 is an 800 x 600 pixel. 800 lumens. 2 kilogram. DLP based home theatre projector. Any questions?

☐ They're easy to set up. You may have to press one button to lock the LCD to an analog video signal, but if you're using a DVI connection, you won't even need to do that. All a novice user can screw up is the brightness and contrast.

☐ They're immune to magnetic interference. No degaussing, ever.

☐ They don't flicker. The signal being sent to an LCD has a refresh rate – a distinct number of frames of video being sent down the cable each second. The LCD monitor itself, though, doesn't repaint its screen like a CRT; wave your hand in front of it and you won't get that strobe-light effect. If even 100Hz CRT refresh isn't flicker-free enough for you, an LCD will be.

✗ LCDs are bad because:

...Well, actually, most of the arguments against LCDs don't apply any more. At least, not to the best screens.

☐ LCDs used to have a hard time displaying a really dark black, used to blur fast action, and used to look weird when viewed from even quite mild angles.

Nowadays, though, many LCDs can display a black that's better than most people put up with from their poorly set-up CRTs.

☐ The new crop of LCD panels with a 12 millisecond pixel response time are, for practical intents and purposes, as snappy as CRTs. Their only limitation is the frame rate of the incoming video. That may still be limited to a mere 75 or so frames per second, to the chagrin of game enthusiasts happy to see even small slices of their 250fps action on a 100Hz CRT.

☐ LCD viewing angles are great these days too. There are still slight brightness changes when you look up or down at the screen, but if you're not doing hyper-critical calibrated colour work (possibly with a black hood over the screen and your head...) then you're unlikely to care.

☐ What's left to dislike about LCDs? The price. A decent 19in CRT (with an 18in viewable diagonal) only costs $400. A 19in LCD (a real 19-incher, with about 1.1 times the screen area of the CRT) still costs $1,100.

Good 17in LCDs are only around $700, though – 20 percent cheaper than a 19-incher, per square inch of screen. 17in LCDs are also the first desktop-sized screens to get the latest new super-black, super-fast panels, so a lot of enthusiasts swallow their pride and settle for a 17in.

Projectors

Video projectors are cheap these days.

Well, as long as 'at least $1,500' is what 'cheap' means to you. That's a real breakthrough compared with what they used to cost, though. The kind of projector power that used to cost well over $5,000 is now $2,000.

There are three basic flavours of video projector. The oldest is the CRT projector, which uses three super-bright cathode ray tubes (for red, green and blue) with focusing lenses in front of them. CRT projectors are good for video, but not for computer graphics. They're also big and heavy, and all but the most expensive models need regular tweaking to keep the three colours lined up.

Today's cheapest small projectors are LCD units, which work more or less like a focused LCD screen with an amazingly bright backlight.

Digital Light Processing (DLP) is the third projector option. DLP uses a micromechanical chip covered with tiny, hinged, electrostatically-operated mirrors. Each mirror bounces light out through the projector's lens with a perceived brightness determined by the ratio of its uptime to its downtime.

The DLP chip is a monochrome device, so DLP projectors also have a spinning colour filter wheel that illuminates the chip with red, green and blue light in very rapid succession.

✓ Projectors are good because:

☐ They're portable. Even the largest LCD and DLP projectors can be lugged around by one person of ordinary strength. Put wheels on a super-portable projector and a Chihuahua could tow it. (Big CRT projectors are best carried by a squad of enlisted men.)

☐ They're quick to set up and stow away. When you want a big screen, it only takes a few minutes to whip out a projector and shoot it at a white wall. A proper roll-up screen is better, but not essential.

☐ They can give you a *huge* image. Modern super-bright projectors with wide-angle lenses (so they don't have to be far back from the screen) have no trouble delivering an image several times as big as even the biggest rear projection TVs, never mind CRT or plasma.

☐ They have good resolution. Even a cheap 800 x 600 projector has enough pixels to be acceptable for PC games – and it probably has a VGA input, too. No other big screen display, at any price, can even come *close* to the resolution of a 1,024 x 768 or better projector.

✗ Projectors are bad because:

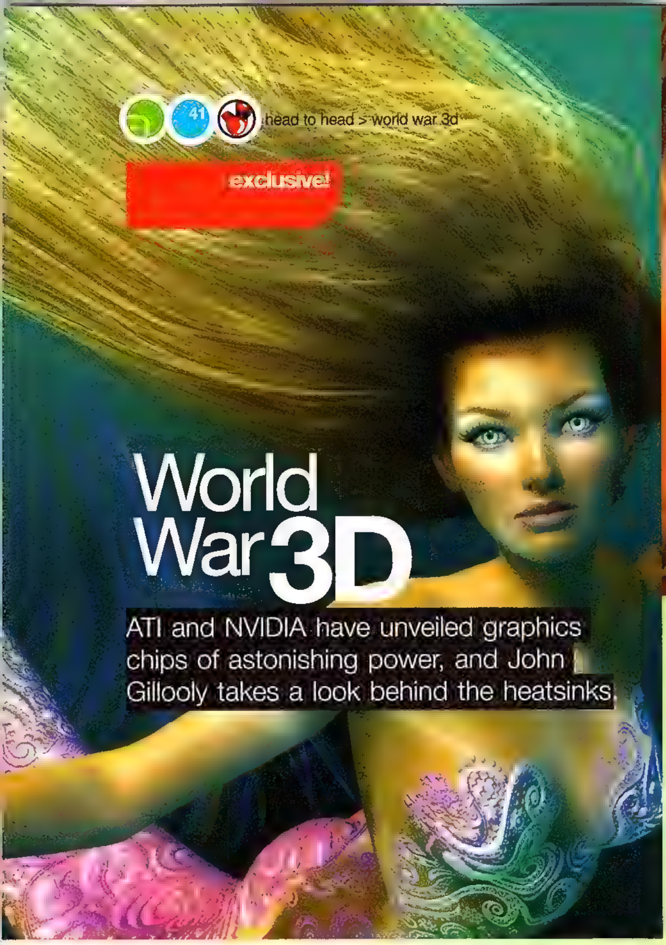
☐ Their bulbs cost hundreds of dollars. Modern projector bulbs often last 3,000 hours, though, so that's not so bad.

☐ They need a dark room. If you're watching a movie then you probably want black to be black. In a front projection system, that means the room has to be dark, because the darkest black a projector can possibly show is the colour of the screen when the projector's off.

☐ The cheap ones wear out. LCD projector panels don't like being hot, but their role in life is to block the light from a hyper-bright light bulb. Many cheaper LCD projectors don't keep the panels as cool as they should. The result is colour balance shifts that can render the image unwatchable, possibly before you've even used up your first bulb.

☐ The more expensive ones' pictures can look weird. The colour wheel system used by DLP projectors can create a 'rainbow' effect that drives some people crazy when they look around the image. Don't buy a DLP projector without watching its output first, and darting your eyes around like a loony.

exclusive!



World War 3D

ATI and NVIDIA have unveiled graphics chips of astonishing power, and John Gillooly takes a look behind the heatsinks.

We love the annual video chip launch season. The outlandish claims of superiority, the intricately modelled female demo stars and the subtle sniping across the frontlines between the two big players. Well the scent of battle is in the air again, and this time both NVIDIA and ATI are bringing out the heavy ordinance for a generation of video chips that makes the once-unassailable RADEON 9800XT seem pretty darn ordinary.

Unlike the previous generation, in which ATI held a tangible performance lead over the respectable but somewhat lacklustre GeForce 5950, this time round we have cards promising similar levels of performance but packing some fundamental differences in architecture, a situation that we haven't seen since NVIDIA and 3dfx were duking it out in the old 16-bit versus 32-bit colour days.

For this generation, NVIDIA has done away with the FX moniker and returned to numbering, with the GeForce 6800 the flagship of the GeForce 6 range. ATI has sidestepped the running out of numbers problem (and nodded slightly to its partnership on Xbox 2) by announcing the RADEON X800.

They are two very different beasts; although they both use 0.13micron process technology, ATI has managed to keep power consumption at a similar level to the RADEON 9800XT (and the required number of Molex plugs to one) thanks to the successful use of TSMC's Low-K dielectric material. On the other hand, the GeForce 6800 has over 60 million more transistors, and without any Low-K material used in construction it sucks a Prescott-smashing 120 watts of power. This means that the 6800 requires a minimum 480W PSU and has two Molex connectors onboard, which must be run off separate 12V rails on the PSU.

Like last generation, the architectural differences will have a big impact on future performance, however the relative benefits will mostly depend on the choices made by the game development community. To understand why, we need to take a look inside the two architectures behind the cards.

RADEON X800

ATI has proven that it has what it takes to be competitive in this market, holding the lead over NVIDIA for well over a year now. A lot of this has been down to the relative simplicity of its 96-bit (FP24) precision shaders and ATI's focus on working efficiently in parallel, which made the R300 series of cards much easier to develop for than the GeForce FX.

For the RADEON X800, ATI has taken this base design, tweaked it up so that it supports longer shader instructions (thanks to an increase in the number of temporary registers), and crammed 16 of the units into the 160 million transistor core.

This means that the X800 retains the same ease-to-program for shaders as the 9800; it just doubles the number of pipelines available to do it. ATI operates off the presumption that keeping all the pipelines busy with smaller shaders allows for much more predictable performance than using longer shaders that only keep a handful of pipelines busy.

The pipelines in the X800 are arranged in groups of four, or quads. This allows ATI to easily scale the core for different market segments; the RADEON X800 XT will have all 16 pipelines active, the X800 Pro will have 12 and while ATI has not yet announced low end variants, the core will easily scale to four- and eight-pipeline versions.

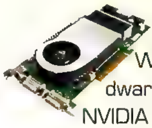
Most of the hardware improvements come from tweaking the shading units but ATI has brought to bear a new technology called 3Dc, which is a means of compressing normal maps for higher detailed images.

By using normal maps, developers can create the illusion of high detail on relatively low polygon models. It's a technique increasing in popularity with developers because it works well with shading and lighting routines.

3Dc allows normal maps to be compressed in a 4:1 ratio. This has a twofold benefit. First, it enables developers to fit more normal maps into the card's frame buffer than they otherwise could; and second, they can increase the detail of the normal maps to soak up spare memory and make for a much sexier image.

ATI demonstrated 3Dc at its Editor's Day, using a special Serious Sam 2 demo from Croteam, and was quite proud of the fact that the technology was incorporated into the game within a day of Croteam receiving hardware.

Valve has also implemented 3Dc into Half-Life 2, a process that apparently took only a few hours to complete.



GeForce 6800

With 222 million transistors, the GeForce 6800 is a monster, dwarfing the 160 million transistors used in the RADEON X800. NVIDIA has used this transistor count to produce the CineFX 3.0 engine, the first hardware to support Shader Model 3.0 (SM3.0). This has been built into DirectX 9.0 since release and should be enabled in the upcoming DirectX 9c release.

SM3.0 brings full 128-bit floating point precision to the entire graphics pipeline. In the previous generation of hardware, NVIDIA supported 128-bit precision (known as FP32) shaders, however the architecture relied heavily on games being coded with a mixture of 64-bit (FP16) and FP32 shading instructions to enable peak performance.

With the GeForce 6800, NVIDIA has abandoned this philosophy of mixed precision and gone down the path of increased parallelism, with 16 pipelines in the core. These pipelines all comply with the SM3.0 specifications. Besides increased precision, this brings onboard pixel shader support for programming techniques like flow control and branching, which enables developers to write shaders that are longer and hence more complex.

It also allows the vertex shader to interact with textures, allowing for more flexibility when using shaders for physics calculations and the like.

This is indicative of a general trend in SM3.0 towards a more general purpose arrangement of processing resources.

Besides bringing to bear enough power for SM3.0, the GeForce 6800 drastically improves performance in the current generation of games, finally moving beyond the relatively poor performance of the GeForce FX series.

What SM3.0 does finally enable is displacement mapping. This is a technique that was supported by Matrox's Parhelia video card, which unfortunately lacked the power to make use of it in games. Displacement mapping uses the vertex shader to physically manipulate a texture surface to create real surface detail, and hence accurate lighting, as opposed to trick methods like bumpmapping and normal mapping. However it remains to be seen how quickly this will be incorporated into games.

NVIDIA has been demonstrating a version of the CryEngine tech demo that uses third generation shaders, and it has publicly stated that it only took CryTek three weeks to implement this code (even though doubt is being cast over how much SM3.0 technology is actually included in the screenshots).

Besides the shading performance, the 6800 brings the second generation of NVIDIA's Ultrashadow technology to market. This is a hardware driven technique that's touted as accelerating games that make heavy use of lighting and shadows, but so far the only major title that is taking advantage of this is Doom 3. This means that the usefulness of Ultrashadow will end up being tied to the prevalence of licensees of the Doom 3 engine.

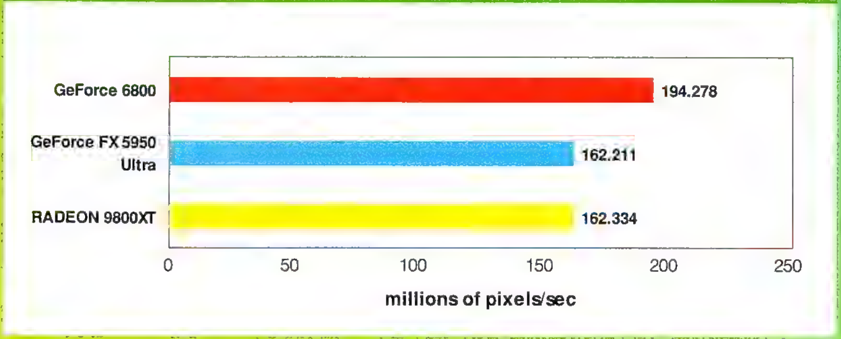
Balancing act.

These are two very different philosophies and it is really in the hands of game developers as to how much focus will be given to either ATI's or NVIDIA's key features. While supports for SM3.0s can be tacked onto existing games, we suspect that for a game to truly take advantage of the inherent flexibility of the new generation shaders, it will need to be incorporated into the game's design from early on in development. That said, NVIDIA's GeForce 6800 will be ready to run such games as soon as they arrive, whereas we will have to wait until ATI unleashes the R500 core before its cards support the third generation of shaders. On the other hand, ATI's 3Dc normal map compression, if it is as quick to incorporate as the company alleges, has huge impact potential in the near future as it allows developers already working with normal maps to increase the detail levels for X800 owners.

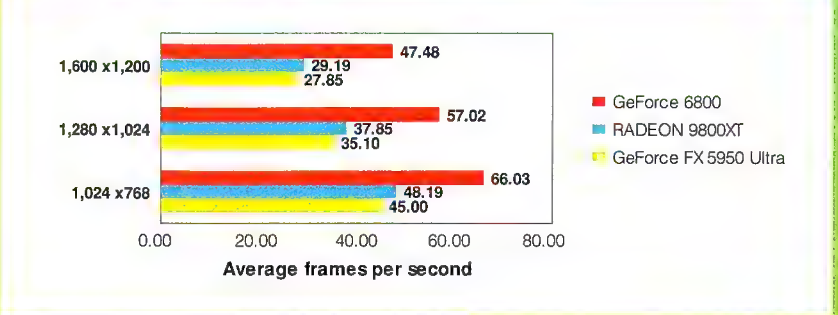
ATI's big advantage is that the X800 is like a RADEON 9800XT on steroids. Games that run quickly on the 9800XT will fly on an X800, and now that ATI's architecture has been entrenched in the market for a year and a half, there are a lot of developers targeting shader model 2, which is at the core of the X800.

Most likely we will not actually see any performance hit for some time. Quite simply, both the GeForce 6800 and RADEON X800 will be CPU-bound in the current generation of hardware. This means that you can crank up the antialiasing and anisotropic filtering to make games look their spangly best, for the CPU makers are unlikely to produce a performance leap to break the CPU-bound situation anytime soon. It also means that it will not be until the next wave of games appear that we will see the full performance picture emerge.

Aquamark 3 Pixel Shader test



Aquamark 3 Standard test



Shady ladies

With each generation of hardware comes the killer demo, designed to show off the capabilities of the hardware to the fullest. This time we have NVIDIA showing off Nalu, the SM3.0 Mermaid. Nalu shows off advanced hair rendering and lighting, with an emphasis on realistic skin textures and soft shadows caused by diffused light permeating the water. It's an amazing piece of animation, with the fluid movement of hair a particular highlight.

ATI has chosen a slightly different route, introducing a new character called Ruby, who 'stars' in its demo, titled 'The DoubleCross'. This demo is an attempt to recreate a scene from a game, in which Ruby battles it out with ninjas and the evil Optico. It is an exercise in creating a complete scene, and highlights ubiquitous shader use, 3Dc normal map compression and some innovative hair and skin rendering, while aiming to make maximum use of the array of shaders.

Much like the performance car world, there are two very different philosophies at work in this generation. Like a V8 muscle car, NVIDIA's GeForce 6800 is big, feature heavy and sucks a lot of juice to get its killer benchmark times. Whereas the RADEON X800 is more like a turbocharged hatchback. It packs just enough features to make it chew through anything that's thrown at it, and does so using minimum power.

Benchmarking the beast

Despite Ben's agitated fretting, we held our benchtesting off until the absolute last minute, but unfortunately ATI was still finalising clockspeeds and the RADEON X800 reference card did not make it to us from Canada in time (we will have comprehensive benchmarking in next issue).

However, we did have a GeForce 6800 in our hands, so we ran it through a gamut of tests to see how it performed against the last generation of high end cards – the GeForce FX 5950 Ultra and the previously-untouchable RADEON 9800XT.

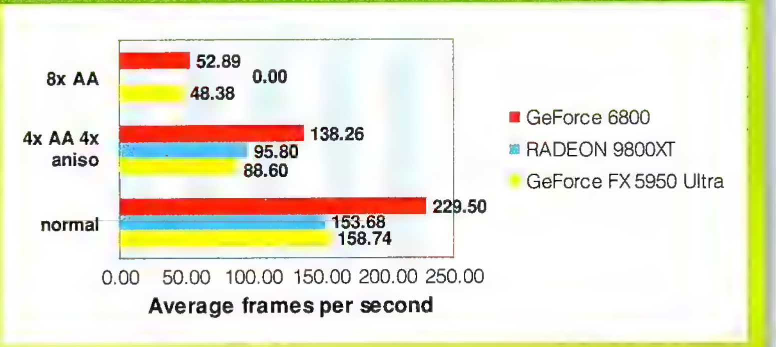
To minimise CPU bottlenecking we tested with a 3.4GHz Pentium 4 Extreme Edition, coupled with our ASUS P4P800-E mobo and 512MB of RAM. We normally use WHQL drivers to avoid cheating issues, however for the GeForce 6800 we had to use the non-WHQL ForceWare 60.72 drivers (which have received special approval by Futuremark for the GeForce 6800 only). For the GeForce FX 5950 Ultra we used the WHQL ForceWare 56.72 set, and for the RADEON 9800XT we used WHQL CATALYST 4.4. We also used a range of benchmarks, but there is no benchmark that stresses SM3.0 (although 3DMark 2004 is soon to be released).

We used UT2003 because the benchmarking functionality in UT2004 is still not ideal. In these tests we can see that the GeForce 6800 is capable of insane framerates under normal circumstances, and even when 8x AA is enabled it still delivers playable frames. At this high level of AA we actually suspected that the card's performance was being limited by the framebuffer size, as it scored almost the same as the notably inferior GeForce FX 5950 Ultra. This is a great example of how you can now use high image quality to soak up frames in today's titles.

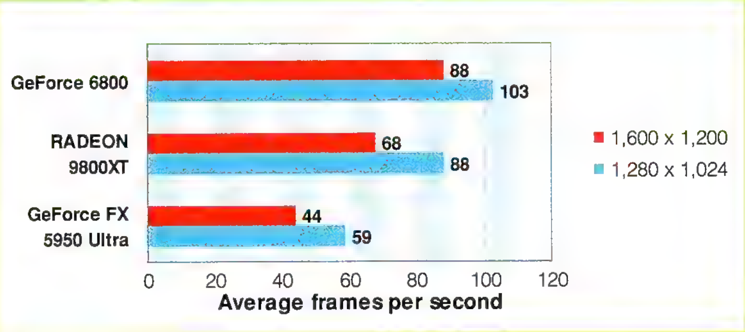
For a title more indicative of the next generation of shooters we turned to Far Cry. This game is a pain to benchmark with – single player demos do not save AI or actions, which makes for wildly fluctuating framerates. So to get a decent comparison between performance we set up a flyby demo in the multiplayer map mp_dune. We then let the demo loop to ensure consistency and the results showed a nice stepping between the three cards. Perhaps the most impressive thing was that the 6800 was almost twice as fast as the GeForce FX 5950 Ultra (Wasn't Far Cry originally an NVIDIA tech demo?).

We also ran a series of synthetic benchmarks. 3DMark03 was included for curiosity value, but after the driver tweaking shenanigans of previous years we take any 3DMark03 result with a pillar (not grain) of salt.

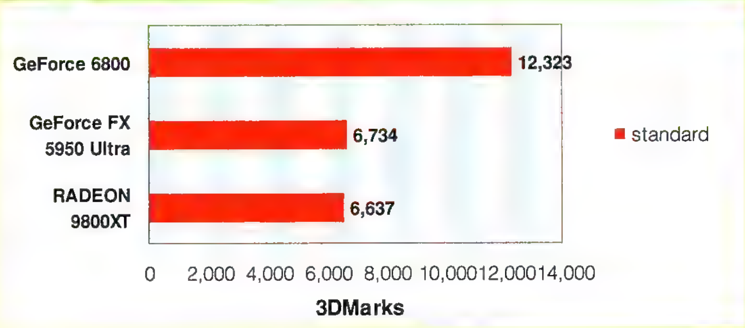
UT2003 - 1,280 x 1,024



Far Cry - High detail



3DMark03



Aquamark3 is a more balanced test of shaders in games as it uses a mix of shader versions to produce a good compromise between performance and visual quality. In the pixel shading tests the GeForce 6800 showed a clear lead in pixel processing speed over the previous generations, as is often the case with the second iteration of a technology. In the general tests the same huge performance leap seen in the games was repeated, with the GeForce 6800 consistently 20 frames faster than the other cards.

The winner

While it remains to be seen how the X800 performs in actual tests (ATI's presentations showed the X800 Pro keeping speed with the 6800 Ultra), what we can definitely state from our testing is that NVIDIA has happily wiped away the failings of the FX series of cards. For the current generation of gaming titles it delivers jaw dropping performance, and it packs the transistors to deal with the next generation of titles as well. Our only big concern was the huge power drain that it had, but for this sort of performance it's really a small price to pay.

We will keep a close eye on things as the cards come into retail. For now though you can rest safe in the knowledge that the battle is well and truly on, and this time around the victor is not such an obvious pick.

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Computers in space

Daniel Rutter opens the pod bay doors and takes one small step for LAN, but one giant leap for WANkind.

NASA was created in 1956, when people were just getting used to the idea of a 'computer' being a roomful of valves, rather than a person with an adding machine.

At the time, the idea of computers in space was pretty ridiculous, and the idea of computers in *unmanned* spacecraft was *very* ridiculous. Valve mainframes needed a team of service personnel to keep them running.

By 1976, though, the Viking probes made it to Mars (a 10 month journey), landed, and sent back pictures for years on end – none of which would have been possible without their meagre on-board computing power.

As you'd expect, the capabilities and complexity of the computers we shoot into space has increased dramatically over the years. Computers have become part of the fabric of space agencies. Designing spacecraft in the first place can eat up as much computing power as designing any other complex system, and aerospace contractors have a great appetite for computerised machine tools, and- Yes, yes, I hear you say, but what about the computers *in the spacecraft*?

Hm. Yes. About them...

The computers that get manned and unmanned spacecraft into space and keep them there tend, we're afraid, to be boringly simple.

Boringness is a very desirable quality in a spacecraft control system. Rockets are quite exciting enough already without a crashed nozzle gimbal controller causing them to arc over and plough into Kansas at Mach 15. Re-entry is a more than sufficiently stimulating experience even when bad attitude control code *doesn't* cause the craft to fall like a billion-dollar leaf.

There's a lot of quite advanced computing technology being flung out of the atmosphere today, but the hardware doing the flinging may, in fact, have little more intelligence than your car's engine control computer.

Little brains, big engines

You don't need a great deal of computing power to perform the basic tasks that define a spacecraft – getting out of the atmosphere, and staying there.

Actually, you don't need any computers at all. If Germany had done a bit better in World War II, something like the projected Sänger Amerika Bomber (www.luft46.com/misc/sanger.html) could, in theory at least, have made it to orbit with 1940s' technology. Manned travel any further out would still have had to wait until at least the 1960s, but orbit ain't that hard. Even aiming for the flyspeck-in-a-footballstadium that is another planet can be done with slide-rule maths, if you're sending an unmanned probe.

Exact answers to the multi-body problems of orbital dynamics are, famously, exceedingly hard to reach. But it's quite adequate to get pretty much the right answer, light the blue touch-paper, see where your spacecraft ends up going, and then do some corrective thruster burns to tidy up its course.

Thirty-six storey tall launch vehicles tend not to have pinpoint accuracy, anyway. Even if your original flight plan is perfect, you still have to tweak the actual result if you're aiming for anything more than a basic orbit.

The computational simplicity of basic spacecraft tasks was good news back in the 1960s and 1970s. Back then, very modest computing power by current standards meant a monstrous mainframe system, which you couldn't possibly loft up the gravity well.

NASA's Mercury capsules of the early 1960s had no computers at all. For re-entry, retro-rocket timing and attitude information was radioed to the spacecraft from a tapes-and-teletypes computer centre on the ground.

The later, two-man Gemini capsules had their own rudimentary computer (capable of 7,000 instructions/sec!), which helped with tricky tasks like rendezvous operations. Without that, the Apollo moon missions wouldn't have been possible.

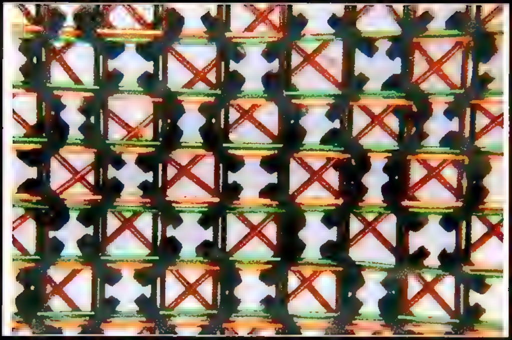
The Apollo missions themselves were a computing landmark, too. The Apollo system computer prototypes consumed, at the time, roughly two-thirds of the world's total supply of integrated circuits.

ABOVE: In 1949, this is what aerospace computers looked like.

Enough antiques

OK, fast-forward to the present day, and the International Space Station (ISS).

The ISS is packed with processors to keep its crew happy, or at least alive, but at the core of its operational hardware are the Command and Control Computers.



ABOVE: Magnetic core memory is still used in mission-critical space computing applications, because it's radiation proof and non-volatile.

They're 80386SX-20s.

But they've got 80387 co-processors! A couple even have hard drives!

Ahem.

Well, the ISS doesn't need a whole bunch of brains. After all, it doesn't go anywhere but round and round.

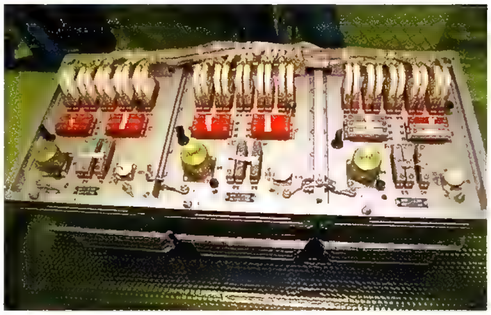
So what about the Space Shuttle?

Well, the Shuttles were originally equipped with five parallel redundant IBM AP-101 general purpose computers. Each of those was equipped with a mighty 1,310,720 bits of ferrite core memory (more had to be tacked on to accommodate the elephantine 700KB size of the Shuttle's control software...), and was good for a neck-snapping 0.48MIPS and 0.325MFLOPS.

As you'd expect, Shuttles these days have greatly upgraded computing power. Apart from a slow increase in the population of special-purpose chips all over the orbiters, they got a major upgrade in 1991.

Since then, they've been running the mighty AP-101S.

It's a whole three times as fast as the AP-101. And has some more memory. And draws less power.



ABOVE: Is anyone surprised that this thing used to run Mir?

That's about it for its improvements.

One reason why the Shuttles haven't been refitted nose to tail with cutting edge hardware is that they just don't need to be. The (slightly updated) old gear runs the vital systems just fine.

The other reason has to do with just how vital those systems are, and just how hazardous space is to computers.

The challenge

Making computers work in space is not too hard. They have to be able to survive the vibration and G-forces of launching, but a laptop can do that with a bit of padding. It's making computers *keep* working in space that's the tricky bit.

The basic challenge of space is remoteness. A submarine only 200 metres beneath the surface of the ocean is in a considerably more dangerous environment than a spacecraft 400 kilometres up (20 atmospheres of water pressure trying to get in, instead of only one atmosphere of air pressure trying to get out...), but it's usually not very hard for a sub to return to the normal sea-level world. If it can't, it's not *terribly* hard to send a rescue vessel down, if the sub's just stuck down there on the continental shelf.

Until we get space elevators and/or antigravity happening, though, space is a lot more difficult to get to. It's that simple fact that's the biggest obstacle to reliable space computing. You've got to take what you need with you the first time.

Some of the *obvious* challenges of space, in contrast, turn out not to be such a big deal.

Weightlessness, for instance, is not a problem for most perfectly ordinary desktop computer components. OK, old ball mouses won't work, and printers may get paper jams, but basic PC components will work just fine, provided they don't rely on convection for cooling. Hot air doesn't rise when no direction is up. If everything's fan-cooled, it'll be fine.

Unless, of course, there isn't any air.

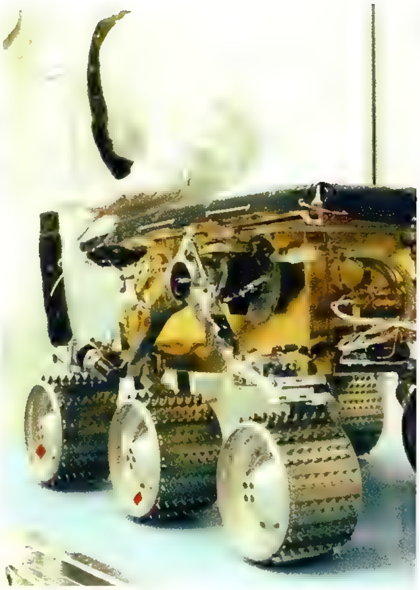
An ordinary PC or laptop won't work at all in vacuum, initially because the hard drive heads need an air cushion to float on. Many people think hard drives are hermetically sealed, but they're not; in vacuum, a hard drive will instantly eat itself when turned on.

Hard drives typically have a maximum operating altitude rating of about 2,500 metres, meaning they don't like pressure much below 11 pounds per square inch (psi). Normal sea level atmospheric pressure is 14.7psi, but many manned spacecraft use lower air pressure. That makes it easier to keep them sealed, but can rule out conventional hard drives for storage; even if you run at full atmospheric pressure, you don't want all your computers crashing if you lose some air.

For this reason, good old tape is used for secondary storage in many space computer systems, including the Shuttle's.

Even with solid state disks, though, conventional computers won't work for long in vacuum. Without air, there's also no air cooling. Many normal computer components will overheat without air flow to cool them; purely radiative cooling is a lot less effective than even passive convection.

And then, there's radiation.



One of the oldest excuses for mysterious system crashes here on earth is 'cosmic ray strike'. Some high energy particle from a supernova millions of years ago whizzes through the vacuum, whacks into a RAM chip, and either it or the spray of secondary radiation from its impact flips one or more bits in the memory. If error detection and/or correction doesn't repair the damage, hilarity ensues.

Cosmic rays have the energy to make it all the way to the planet's surface, but they're a bigger radiation source outside the atmosphere. Space computers also have to deal with the sun's 'solar wind', which is composed of electrons, protons (hydrogen nuclei), and light doses of heavier nuclei. The solar wind sleets out from the star all the time, though it's stronger when there's lots of sunspot or solar flare activity.

ABOVE: The Intel 80C85. Is there anything it can't power?

The earth's magnetic field traps solar wind particles in the Van Allen radiation belts, which stop most of them making it to the atmosphere. But the Van Allen belts aren't very high up. Even spacecraft in low earth orbit plough through them, and they're a significant source of spacecraft radiation exposure.

Shielding ordinary commercial computing gear against even the mild radiation of low earth orbit has been officially described by NASA as 'futile'. You just run the thing. If it crashes, you reboot it. Deal with it. Don't use it to control your oxygen supply.

For more critical systems, spacecraft use special radiation-hardened versions of current CMOS chips (hardening can be achieved by something as simple as reducing the transistor density), or they stick with good old bipolar transistor technology, which is inherently much less radiation-sensitive.

A radiation-hardened 80C85 (the CMOS version of the Intel 8085) did the thinking for the Sojourner rover on Mars. The Pathfinder lander and the later Spirit and Opportunity rovers, though, got a lot more grunt; they all use the popular RAD6000, which is a hardened version of the 25MIPS IBM RS/6000, the chip before the PowerPC.

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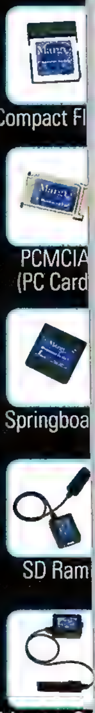
Margi seen here with the Optoma EP-732 and Sony Clie PDA.



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ABOVE: Rumours that the Shuttle's IBM flight computers will self-destruct if anyone on board uses any laptop but a ThinkPad have not been confirmed.

From your desk to LEO

So it's not all hardware older than Britney Spears up there. Actually, people use regular laptop PCs on spacecraft too.

Us earthbound misfits like laptops for the same reasons astronauts do – compactness, convenience, somewhere to store your digital photos. Laptops are good for space use for one more reason though – even when they're not running from battery power, they don't draw a lot of juice.

Electrical power is a problem for spacecraft. They often don't have a lot of it, and even if they do, they don't want to use too much.

Lack of power has to do with where spacecraft get it. Solar panels don't work when something – like a planet – is between them and the sun. Fuel cells don't come with limitless fuel. Radioisotope thermoelectric generators can run for years without maintenance, but they don't make a whole lot of power.

The reason why it's a bad idea to use a lot of power in space even if you've got it coming out of your ears is that every watt of power consumed aboard a spacecraft gives a watt of heat that then must be disposed of, along with heat from the sun (reflective foil on spacecraft is there to stop the sun warming it up).

A spacecraft hanging in vacuum is the world's biggest Thermos bottle, and getting rid of waste heat is a major problem. Many spacecraft have big black radiator panels for this purpose; they often resemble solar panels, but are aligned edge-on to the sun.

Most of the heat sources on spacecraft are not computer-related – solar panels and microwave transmitters are actually the major culprits – but every little bit helps.

Hence the use of laptops with modest CPUs, not Prescott P4s.

The future

So far, space computing has leaned strongly towards the KISS theorem – Keep It Simple, Stupid.

Sure, there are super-sophisticated science and communications and spy satellites up there, but they do a lot more data acquisition, delivering and relaying than they do processing; their technology's in the sensors and antennas, not in the computers. If you've got enough microwave link bandwidth, there are good reasons to do computational gruntwork on the ground, where it won't cost you a hundred million dollars to get someone to replace a toasted expansion card.

We live, however, at the beginning of a new age of private space exploration. The big space agency bureaucracies have, historically, been about as enthusiastic about private enterprise in space as they have been about Catastrophes At Take-Off. But their stranglehold is slowly, slowly loosening.

There's nothing magical about private enterprise that'll exempt its orbital (and beyond) IT ventures from existing problems with power, heat, radiation hardening and software reliability. But just having a whole lot more people working on the problems can only help, and cheaper launch systems will let more people loft more satellites for less money, making the higher reliability of old, slow systems less critical.

ABOVE: It looks as if it can transform into a robot, but Scaled Composites' X Prize entrant won't even *try* to reach orbit.

Moving more MIPS into space will, for instance, allow us to create actual space-based server networks, giving efficient extraterrestrial data routing for all, with the signal touching dirt only at the endpoints. Iridium's there already, but it's expensive and slow. A mere 128Kb/s would be a vast improvement.

It's early days yet. To win the much-publicised US$10 million ($13.9 million) X Prize, all someone has to do is throw three people to a 100 kilometre altitude and bring 'em back alive, twice in a fortnight. Straight up and straight down are fine; no orbit is needed.

There are private companies making real orbital launch vehicles, though, even as the chipmakers we know and love reduce the watts per MIPS and push into other new, less space-sensitive technologies. Optical computers should care a lot less about ionising radiation.

Realtime webcam footage from space tourists? LAN parties with computers stuck to all six walls with Velcro?

Watch this space.

Disclaimer

If you decide to use any of the methods described in this guide, you do so at your own risk. If you damage or otherwise render inoperable (or partially operable) any of your components, chances are you'll have to buy new ones. So, if you can't afford to lose something, then don't overclock it.

Overclock part 1

Overclocking isn't just a tidy way to boost performance. It's more than that. It's every Atomican's favourite hobby, and knowing the tricks is what separates us from the rest. Overclock King Chris 'DonutKing' Byrne imparts his mighty wisdom in this thrilling two-part series.

This is the first part of a two-part guide. In this article, we'll cover the basics of overclocking and next month we'll look at the more advanced concepts for specific CPUs. Information for beginners can be found on the *Atomic* website, at the following URL: www.atomicmpc.com.au/forums.asp?s=2&c=6&t=510.

If you don't understand something, check the above link out.

The basics

Before you start overclocking, ensure your system is already stable – trying to overclock an unstable system won't do you much good. You should also disable the automatic reboot option, which will prevent your system from restarting when it encounters an unrecoverable error (also known as a 'blue screen'). This will make diagnosing problems easier. To do this, right click My Computer, select Properties, click the Advanced tab, click on Settings under Startup and Recovery, and untick the Automatically Restart tick box.

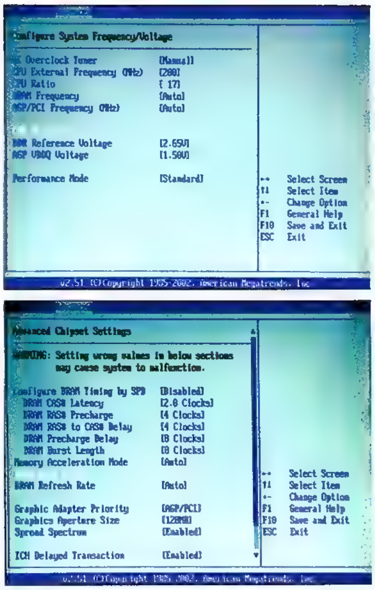
Be sure to note where your CMOS or RTC Reset jumper is on your motherboard, as you'll likely need it. This sort of information can be found in the manual that came with your motherboard.

If at all during this guide your computer fails to boot, turn it off for 10 seconds and then back on again. If that doesn't work, turn the power off, set the CMOS/RTC Reset jumper to RESET/CLEAR for around 10 seconds, set it back to NORMAL and turn the system on again. 'Setting' this jumper will involve moving it from one set of pins to another. This will wipe all non-default settings from your CMOS setup and the system should boot. Again, you will need your motherboard manual, as the majority of boards tend to refer to these functions by different names (as well as having them in different locations).

BIOS for beginners

Some motherboards won't have BIOS options for the functions mentioned below – you may have to change a jumper or switch on the motherboard itself, however; there's a chance your motherboard may not support these particular settings. In this case, you'll likely be restricted as to how much overclocking you can do.

To get into your computer's BIOS, reboot your system and press the DEL key when



```
onfigure System Frequency/Voltage

 Overclock Tuner                 [Manual]
PU External Frequency (MHz)      [200]
PU Ratio                         [ 17]
RAM Frequency                    [Auto]
GP/PCI Frequency (MHz)           [Auto]

DR Reference Voltage             [2.65V]
GP VDDQ Voltage                  [1.50V]

Performance Mode                 [Standard]        ←→   Select Screen
                                                   ↑↓   Select Item
                                                   +-   Change Option
                                                   F1   General Help
                                                   F10  Save and Exit
                                                   ESC  Exit

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```

```
anced Chipset Settings

ING: Setting wrong values in below sections
       may cause system to malfunction.

onfigure DRAM Timing by SPD      [Disabled]
  DRAM CAS# Latency              [2.0 Clocks]
  DRAM RAS# Precharge            [4 Clocks]
  DRAM RAS# to CAS# Delay        [4 Clocks]
  DRAM Precharge Delay           [8 Clocks]
  DRAM Burst Length              [8 Clocks]
Memory Acceleration Mode         [Auto]
                                                   ←→   Select Screen
DRAM Refresh Rate                [Auto]            ↑↓   Select Item
                                                   +-   Change Option
Graphic Adapter Priority         [AGP/PCI]         F1   General Help
Graphics Aperture Size           [128MB]           F10  Save and Exit
Spread Spectrum                  [Enabled]         ESC  Exit

ICH Delayed Transaction          [Enabled]

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```

ABOVE: Modern systems allow the user to overclock and tweak via the CMOS setup. Older computers require the changing of jumpers on the motherboard.

prompted. This message usually appears at the top or bottom of the screen. Be aware that you may need to press the F1, or another key, instead.

Go into your computer's CMOS setup and set the following settings (if available):

FSB:RAM – set to a ratio of 1:1
AGP clock – set to 66MHz
PCI clock – set to 33MHz.

Again, remember that depending on your motherboard, these options may appear under different names, so make sure you clarify them by checking your manual.

These options are usually found under a section called Advanced, CPU Setup, or similar.

Find the CPU Speed option, and make sure it's set to Manual/User Define. Increase the Front Side Bus (FSB) setting (also called Host Clock or CPU External Frequency) by 5MHz. Save and quit.

This is the setting that synchronises most devices in the system – RAM, CPU, PCI bus speeds, etc are all derived from this clock setting.

If the computer boots up (it should in most cases), and is stable (try running a program like Prime95 – see 'Software' later in this article), you have successfully overclocked your system! But don't get excited because 5MHz FSB isn't much at all. You can use CPU-Z (again, see 'Software') to check the frequency the CPU is running at.

When increasing the FSB, pay attention to the PCI and AGP bus speeds. Most modern systems have these locked at the default of 33MHz and 66MHz respectively (AGP speed is double PCI speed). If you don't have a lock feature on your motherboard, increasing the FSB will also increase these bus speeds. Not much is gained from overclocking these, and having them running 'out-of-spec' will interfere with your devices – it can even cause data corruption. The PCI bus speed is determined by dividing the FSB by a certain factor. If the FSB you choose isn't a multiple of 33, then your PCI bus won't be at stock speed. On some motherboards without the lock, when you go to change the FSB, there will be a second number – for example 133/33 or 150/30. The second number is the PCI bus speed – ensure it remains around 33. Any number between 30 and 38 is unlikely to cause problems; however, you should still take care.

FSB and CPU speeds aren't necessarily linear – if you raise the FSB by 5MHz, you'll more than likely see the CPU speed increase by an amount larger than this. This is thanks to the CPU 'multiplier' – your final CPU speed is the product of your FSB and this value. If you had a 2,000MHz CPU on a 100MHz FSB, the multiplier would be '20x'. Most processors sold today are 'multiplier locked', so you can't use a different multiplier. While locked CPUs will allow you to change the multiplier setting in the BIOS, it will not boot.

If you're fortunate enough to have an unlocked CPU, you can try increasing the multiplier by one step (usually 0.5x) and see what effect this has on CPU and FSB speeds. You generally want a high FSB for your overclock, rather than a high multiplier, so try lowering the multiplier and raising the FSB to get a higher FSB for the same CPU core speed. This will increase performance across the board – pun intended – as the FSB affects more components than the CPU multiplier.

If your CPU is stable, go back in and increase the FSB by another 5MHz. Reboot and test for stability again, and repeat the process. If you think you are getting close to the ceiling for your CPU you can try going up or down in smaller increments than 5MHz to find the 'sweet spot'.

If your CPU isn't stable, then you'll need to track down the problem and try to rectify it. If you find you're getting blue screens, try increasing the RAM latencies. Under Advanced Chipset or similar, you should find a setting called SDRAM Configuration or Memory Timings. This may be set to SPD, which is the RAM module's default. What we need to do is change this value to User Define/Manual, and set it ourselves. Basically, lower numbers are faster but less stable. Increase these numbers a notch and see if there is any improvement. You can also change the FSB:RAM ratio (covered earlier). Finally, you can try increasing the RAM voltage or VDIMM. Default should be around 2.5V-2.65V for DDR, so notch it up a tad. Keep in mind that extra voltage beyond what you need won't help – all it will do is generate additional heat. So be conservative with voltage increases. You can also try increasing the motherboard chipset voltage (VDD), which might help at high FSB speeds.

If you think your CPU has maxed out, try increasing the CPU voltage (sometimes called VCC or VCore) in small increments. Again, extra voltage creates extra heat so don't use any more than required. Better cooling can also help.

ABOVE: A good HSF is critical to your endeavours. Water cooling solutions are becoming effective and affordable, while stock air cooling is improving too.

Cooling

It is a good idea to invest in a better HSF than the one bundled with most CPUs if you plan on overclocking your system. If your crashing isn't due to memory woes, then it's likely you have a heat problem.

The Intel stock HSF isn't too bad, but you can get better. The AMD stock HSF is adequate, but serious overclockers will almost always use something bigger (more area to dissipate heat) and louder (faster fans mean better heat distribution). There is also water cooling or phase change cooling, but for this article we'll focus on air cooling (fans).

When buying a new HSF, there are a few things to look for, like the metal used in the heatsink. Copper conducts heat better than aluminium, but is heavier and more expensive.

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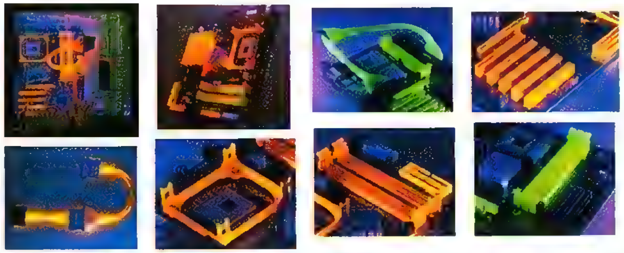
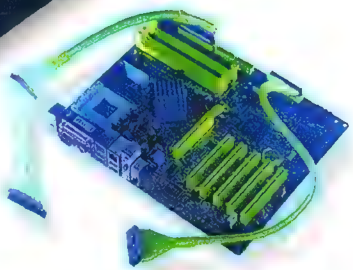


It's excellent, in performance ...



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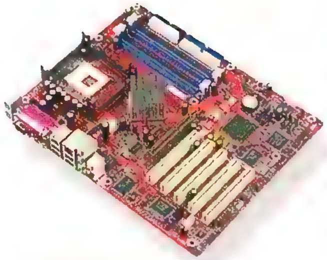
Chipset nForce2 Ultra 400 + MCP-T
CPU: AMD AhtlonXP
FSB400 / Dual DDR400
SATA RAID / Realtek Dual LANs
AGP8X / 6ch Audio



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Some aluminium heatsinks have a copper insert on the bottom as a sort of compromise. Bigger heatsinks with many fins have more surface area for air to flow across and are often better performers.

Check that the HSF will fit on your motherboard before buying. Components on some motherboards can get in the way, and the more heavyweight HSFs that bolt through the motherboard will require additional mounting holes around the CPU socket. This will make it harder to install but minimises the chance that it will fall off, or cause damage in transit.

Thermal pastes can also influence cooling. These are compounds that sit between the CPU and the heatsink to fill microscopic gaps and assist heat transfer to the HSF. Stock HSFs come with a thermal pad that is not reusable (so keep this in mind if you plan on removing your HSF in the future). An aftermarket heatsink usually comes with a tube of generic thermal paste. You only need a very thin layer – too much will increase temperatures rather then reduce them. Pastes come in several types – the most common are made from silicone, while the more expensive varieties are made from metals like silver. Metal-based compounds offer superior cooling, but are electrically conductive, so care must be taken when applying. Silicone compounds are usually non-conductive. There is a few degrees' difference between high and low end compounds – whether it's worth the extra cost is up to you.

Many high-quality heatsinks don't include fans – they must be bought separately. Fans come in all shapes and sizes. Bigger physical dimensions and higher revolution speeds (RPMs) guarantee more airflow (measured in cubic feet/minute or CFM). More airflow also means more noise. However, bigger fans can spin at lower RPM and still provide the same airflow as a smaller fan at a higher RPM. Noise can also come from the fan motor, which can be avoided by buying ball bearing fans rather than the cheaper sleeve bearing types.

Don't forget case cooling – even the best HSF will perform poorly with no case ventilation. The motherboard's Northbridge is also important (usually located near the CPU, and on more modern boards, has a heatsink attached) – this can get quite hot in an overclocked system. There are many Northbridge heatsinks available but check that they fit your motherboard before buying.

RAM is hot

Quality RAM is critical to your overclock, as most modern CPUs are multiplier locked. Most systems these days use DDR SDRAM, so this will be our focus.

To get a high FSB, you will need RAM that's up to the task. First, don't buy generic RAM – it can be problematic and usually doesn't like overvolting. The more expensive varieties can take higher voltages, and in some cases *require* higher voltages than default before they'll run at their advertised speed. If your motherboard supports dual channel RAM, try to get two identical sticks from the same manufacturer. You should also get something with a higher speed rating than your FSB (memory rated at 133MHz if your FSB is 100MHz) otherwise your RAM will hold back your overclock.

PC Rating	DDR Rating	Actual clockspeed (Mhz)
PC1600*	**DDR200**	100
PC2100*	**DDR266**	133
PC2400	**DDR300**	150
PC2700*	**DDR333**	166
PC3200*	**DDR400**	200
PC3500	**DDR433**	216
PC3700	**DDR466**	233
PC4000	**DDR500**	250
PC4400	**DDR550**	275

ABOVE: This table shows the actual clockspeeds of different types of DDR RAM. Remember that AMD Athlons have a 'double-pumped' FSB and Pentium 4s are 'quad-pumped'. So, a 333MHz FSB Athlon and an 800MHz FSB P4 require at least PC2700 (166MHz multiplied by two is 332MHz) and PC3200 (200MHz multiplied by four is 800MHz) respectively. *These four are official JEDEC standards for DDR RAM.

Dividers and ratios

RAM dividers and ratios, which we have previously covered somewhat, can get confusing. They tell the system how fast the RAM should operate in relation to the FSB. It is usually expressed as a ratio of two numbers, ie: 1:1 means that the FSB and RAM speed are the same. You have to divide the FSB by the first number, then multiply the result by the second number to get the RAM speed. So for 200MHz FSB, at 3:2 ratio, the RAM speed would be 133MHz: (200/3) x 2 = 133. It works the other way too – the RAM can run faster than the FSB, for example, at a 4:5 ratio. With a 200MHz FSB, this will cause the RAM to run at 250MHz: (200/4) x 5 = 250MHz. The RAM speed will change with the FSB at the selected ratio changes.

Sometimes the BIOS won't have a ratio; instead it will have values like 133, 166 and 200MHz for the RAM frequency, or perhaps DDR400, DDR333, and DDR266. This is what the RAM runs at when the FSB is at a certain frequency – for most recent Intel-based motherboards this is 200MHz. You can then figure out the divider ratios: 133MHz (DDR266) would be 3:2 ratio (200MHz:133MHz), 166MHz (DDR333) would be a 6:5 ratio (200MHz:166MHz), and 200MHz would be 1:1 ratio. The value displayed in the BIOS usually isn't updated at different FSB speeds, so you'll have to find out the ratio and then find the RAM speed for the current FSB. For example, if you chose DDR266/133MHz (a 3:2 ratio), and the FSB was 250MHz, the RAM would run at 166MHz.

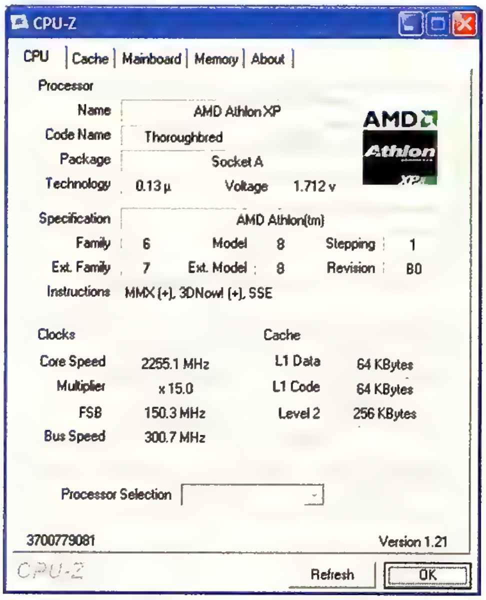
The best situation for any system is to have the RAM and FSB synchronous at 1:1, and at low latencies as well. That said, there is little performance loss outside of benchmarks from a divider that runs the RAM slower than the FSB, or higher latencies, especially if you make up for it with a bigger overclock. Athlon systems are affected greatly by RAM latencies. For P4 systems, raw memory bandwidth has more of an impact.

A lesson on latencies

The latencies of a RAM module are usually expressed as a set of three or four numbers, separated by dashes (for example, '2-3-3-5'). The first number is CAS latency (CL) which has the largest effect on performance, then RAS precharge (RP), then RAS to CAS delay (RCD) and finally RAS active time or cycle time (tRAS). Lower numbers here are better except perhaps for tRAS. You have to experiment to find the best value for tRAS as it varies. The sweet spot seems to be 8 or 11 in many cases. However, poor tRAS values won't make a noticeable difference except when benchmarking. You can use a program such as SiSoft Sandra to check memory bandwidth and find out which is the best setting to use for your system.

Unfortunately, high speed RAM usually has poor timings. Be wary of modules that use Hynix D43 chips (often seen on PC3700 modules) – they don't handle low latencies very well. You're better off chasing RAM that uses Winbond CH-5 chips or even better, BH-5 chips. These chips generally run better at low latencies than the D43 does. On the flipside, some high-spec RAM sometimes won't be stable unless it has fast timings; for example, it may be unstable at CL2.5 or CL3 at 200MHz, yet be stable with CL2. Some motherboards don't like high latencies at certain FSB speeds either. So if you are getting errors or crashes that you think are the fault of your RAM, try increasing and decreasing latencies and see if the system is still unstable.

In most other cases, if you run the RAM less than its rated speed, you can usually lower the latencies without any trouble for some extra performance. Some extra voltage might help, but as always, be conservative when overvolting.



Processor
Name AMD Athlon XP
Code Name Thoroughbred
Package Socket A
Technology 0.13 µ Voltage 1.712 v
Specification AMD Athlon(tm)
Family 6 Model 8 Stepping 1
Ext. Family 7 Ext. Model 8 Revision B0
Instructions MMX (+), 3DNow! (+), SSE

Clocks
Core Speed 2255.1 MHz
Multiplier x 15.0
FSB 150.3 MHz
Bus Speed 300.7 MHz

Cache
L1 Data 64 KBytes
L1 Code 64 KBytes
Level 2 256 KBytes

Processor Selection

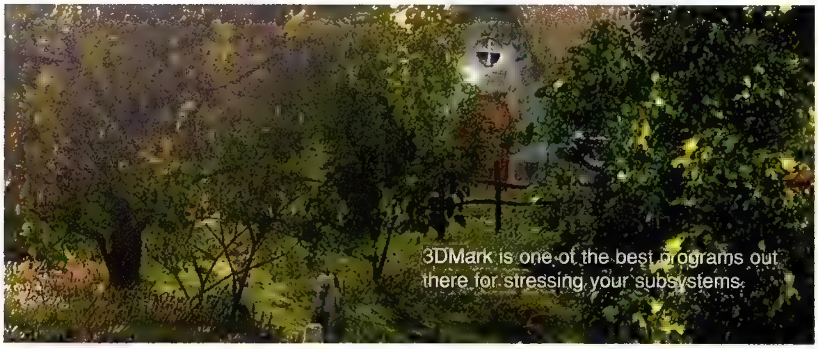
3700779081
Version 1.21

ABOVE: CPU-Z is a handy little app that can analyse and report back detailed information about your CPU, including clockspeeds, cache size and even the core codename.

Software

Prime95 – www.mersenne.org/freesoft.htm
This program performs complex mathematical equations that stress the CPU. It features a 'Torture Test' mode, which can be left running for hours on end. Hardware at the limit will cause Prime to fail, usually within minutes. Stable overclocks will last hours, even days.

3DMark – www.futuremark.com/download
This program primarily tests the graphics card. However, in 3DMark2001SE, the CPU speed has a big effect as well. 3DMark03 is available, but CPU speed is a minor consideration. This simulates a typical 3D game, stressing the CPU, RAM and graphics subsystem and gives a score for comparison with other systems. 3DMark2001SE loves high FSB speeds and low latencies. If it crashes to the desktop shortly into the test it usually means your RAM is at its limit – try increasing RAM latencies or voltage. Also, remember that you only have to run the four game tests to get a valid benchmark score.


3DMark is one of the best programs out there for stressing your subsystems.

CPU-Z – www.cpuid.com/cpuz.php
CPU-Z is a processor reporting application. If you don't know what core your CPU is this will tell you. The program also displays info like clockspeeds, multipliers, and more. It's great for proving to doubting friends that your CPU really is overclocked.

Clockgen – www.cpuid.com/clockgen.php
This is a great little program and makes overclocking much easier. It can change your multiplier and FSB through Windows. As it's software overclocking, you can set the BIOS to stock and use this to overclock. You can go up in small increments quickly without rebooting, rather than restarting and changing BIOS settings, then booting and checking stability. This makes finding your overclock limit a quicker process. It can also change the CPU voltage, but this feature is currently buggy and shouldn't be used. Versions are available for several different motherboards, both Intel and AMD.

Memtest86 – www.memtest86.com
This program copies itself to a floppy or a CD-ROM which it then boots off and runs a series of tests on your RAM. This allows Memtest to bypass Windows and not initialise most other devices, to exclude anything else that could cause errors. You can run this test at stock speeds to find any physical defects with your RAM, or at high FSB speeds or fast latencies to check if your RAM is generating errors.

Sisoft Sandra – www.sisoftware.net/?location=update
This program performs synthetic tests on your system such as RAM bandwidth and CPU operations per second. This allows you to see what overclocking does for the performance of a specific part of your system. It can also be used to perform stability tests.

That concludes this month's article. Next month we take an in-depth look at specific CPU types and delve into the more advanced tricks and techniques.

Bibliography and helpful links

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*Art*omic. That says it all. Well... while its wordy-empathic nature does convey a sense of niceness, it doesn't explain the precious, precious details. Lucky for you, we've gracefully reproduced them here in glowing colour.

If your *Art*omic entry is chosen for show in the magazine, you'll win a copy of combustion 3, a nifty composition app from our pals at discreet (www.discreet.com). As a bonus, all entries are automatically eligible for the grand prize of 3ds max, the best 3D program ever. The winner will be announced at year's end. All you have to remember is that all *Art*omic pieces need to be original and hardware- or games-based.

Send your art to:
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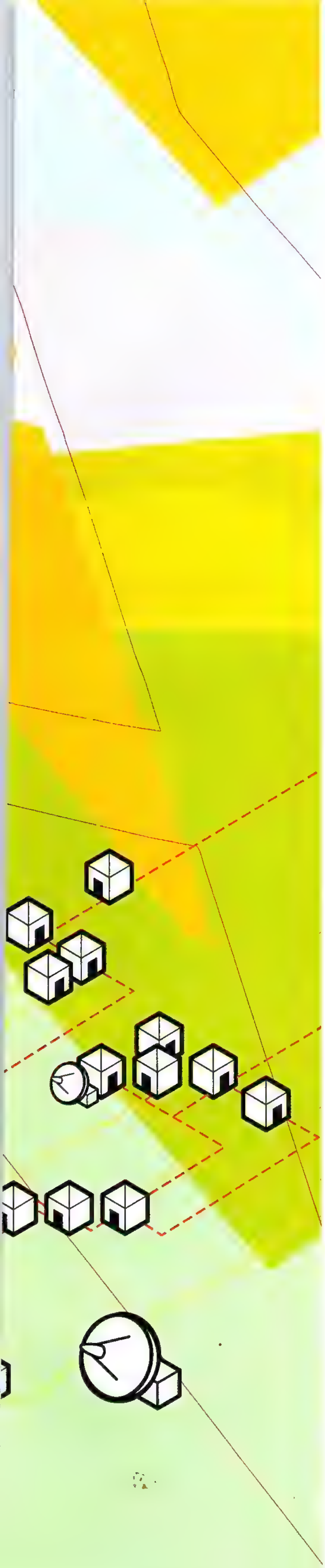


Reviews

Mr FLOPpy

John Gillooly wonders what to do with all those lovely new shading pipelines.

While the supercomputing fraternity will argue that 16 pipes delivering only 192 GigaFLOPS are hardly examples of massive parallelism, the GeForce 6800 and RADEON X800 are massively impressive pieces of silicon. And, more importantly, both cards back it up with mind boggling levels of performance.

So mind boggling in fact that they are leaving the humble CPU behind in a heck of a lot of current games. Take a look at the Call of Duty graph below to see just how strangled the GeForce 6800 can be. It is not until 8x antialiasing is applied that framerate dips at all, a trend that will be common until games start to really tax the shading units in these next generation behemoths.

We have seen this in the past of course, and it's not a bad thing by any means. Being able to tweak up AA and anisotropic filtering means that we can make our games look even spanglier than they used to be, and crank up the candy higher than ever before. But it still means there is an upper limit on framerate. And dammit, I want my tearing back.

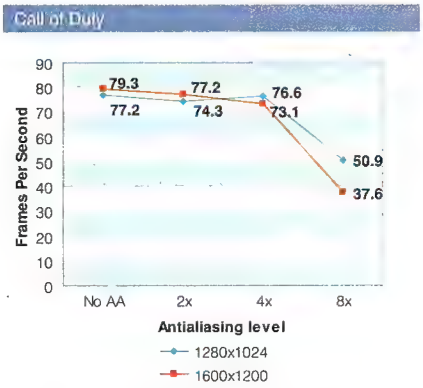
At this year's Game Developers Conference (GDC) in the US, the overwhelming message was that more effort will be going into physics and AI over the next few years. While the potential for non-player characters that are as smart as they are floppy is tingle inducing to say the least, it will inevitably eat into those already limited CPU cycles.

It is certainly an area where attention is needed, as AI competence in particular has taken a back seat to visual delight over the past few years. To drag out gaming cliché number 37, when was the last time you experienced enemy AI like that in Half-Life?

There have been glimpses, but for every dastardly flanking manoeuvre in Far Cry there are still mercenaries getting stuck on ladders, and Trigen AI seems to involve a formula along the lines of 'See guy in Hawaiian shirt, run directly at guy in Hawaiian shirt, slash, repeat'. Sure it is light years ahead of truly woeful games like Soldier of Fortune, but it's still sub-standard.

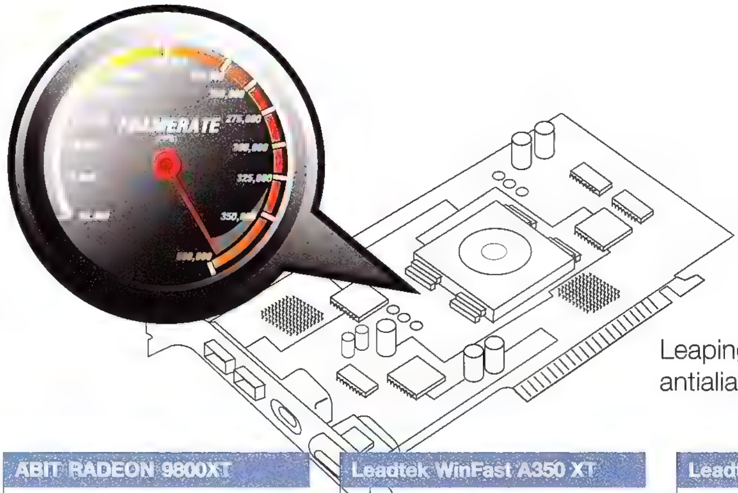
Physics on the other hand has come a long way, but it is still largely fixated upon collapsing corpses and occasionally nudgeable scenery. It's going to take a few years before systems will be able to cope with deeply interactive environments but the promises made by titles like Half-Life 2 mean that the first steps have been taken.

So where does this computational competition leave our humble graphics chip? While the obvious worry is that it will make for CPU limited performance unless the shader units are maxed out, an end to the problem is in sight – balance the load more by shifting some traditionally CPU based tasks to the graphics chip.


Call of Duty

We asked ATI's director of hardware engineering, Bob Drebin, about this and he pointed to the big potential for shifting physics calculations to the graphics chip, as they are the sort of numbers that work well in a parallel processing environment. NVIDIA has put forward a similar line about the potential for shader units to crunch physics as well. Since GPUs are technically 'Turing Complete' processors, they can technically do any calculations that a CPU can, but the wiring is currently best suited to physics.

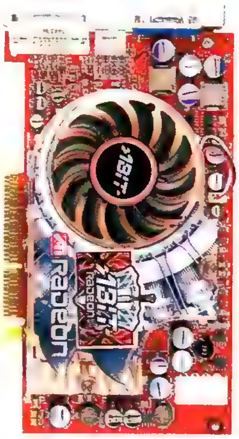
This is still a while away, and those numerous shading pipes will definitely be used by upcoming games in the interim. But it is good to know that there is an option to take the load off the poor old CPU in the pipeline, or should I say, pipelines.



Framerate

Leaping to the bleeding edge, we benchmark some 30x antialiased and triple- quintuple buffered Solitaire frames.

ABIT RADEON 9800XT

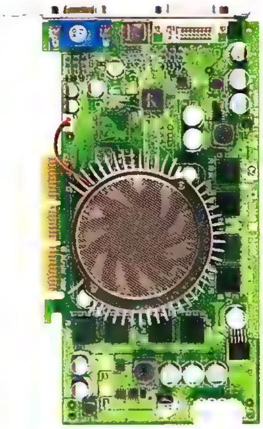


Specifications: ATI RADEON 9800XT; 256MB 256-bit DDR RAM; 400MHz dual RAMDACs.
Core speed 412MHz
Memory speed 730MHz
Price: $730
Supplier: Altech
www.altech.com.au

Harr laddies, we 'ave ourselves another ripper as the price falls again on the brute RADEON 9800XT. With no defining doohickie that can differ the lot, it seems this baby is less raunchy to the rest of the pack. It's due to Zen and electrickery not lettin' anything be the same. Who be you to complain about several points, matey? This son of a gun has an ABIT sticker, leading us to one possible conclusion: we be sure ABIT's waiting to brand anything it comes in contact with, like me parrot.

ABIT
www.abit.com.tw

Leadtek WinFast A350 XT

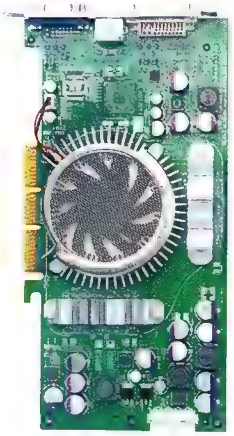


Specifications: NVIDIA GeForce FX 5900XT; 128MB 256-bit DDR RAM; 400MHz dual RAMDACs.
Core speed: 390MHz
Memory speed: 700MHz
Price: $347
Supplier: Rectron
www.rectron.com.au

This card is overly impressive. You see, its eight 16MB BGA memory modules are rated at 2.8ns (which means they run at 714MHz) yet what stoked us was how much further they were willing to go. We easily pumped the memory to 953MHz, which is beyond a 2.2ns (910MHz) chip, with the core happy to breeze along at 472MHz. This overclock yielded almost another 10 frames in CoD, at 72 frames. The GeForce 5950 Ultra performance, and being surprisingly chilly yet quiet, is beyond gold.

Leadtek
www.leadtek.com.tw

Leadtek WinFast A360 Ultra

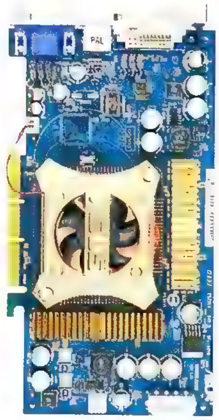


Specifications: NVIDIA GeForce FX 5700 Ultra; 128MB 128-bitDDR RAM; 400MHz dual RAMDACs.
Core speed: 475MHz
Memory speed: 950MHz
Price: $328
Supplier: Rectron
www.rectron.com.au

Using GDDR3, this card has its advantages. The most immediate is the ability to run at much higher frequencies, but it becomes a case of the core being the bottleneck. We managed to overclock the memory on the WinFast A360 Ultra to 1.11GHz and the core to 570MHz, bringing CoD up to 73.8fps. Not that much of a performance boost, so GDDR3 will be somewhat like to the 128MB vs 256MB debacle – useful when its time comes. Otherwise, this is a decent card that manages to outperform NVIDIA's range.

Leadtek
www.leadtek.com.tw

ASUS V9950 Gamer Edition



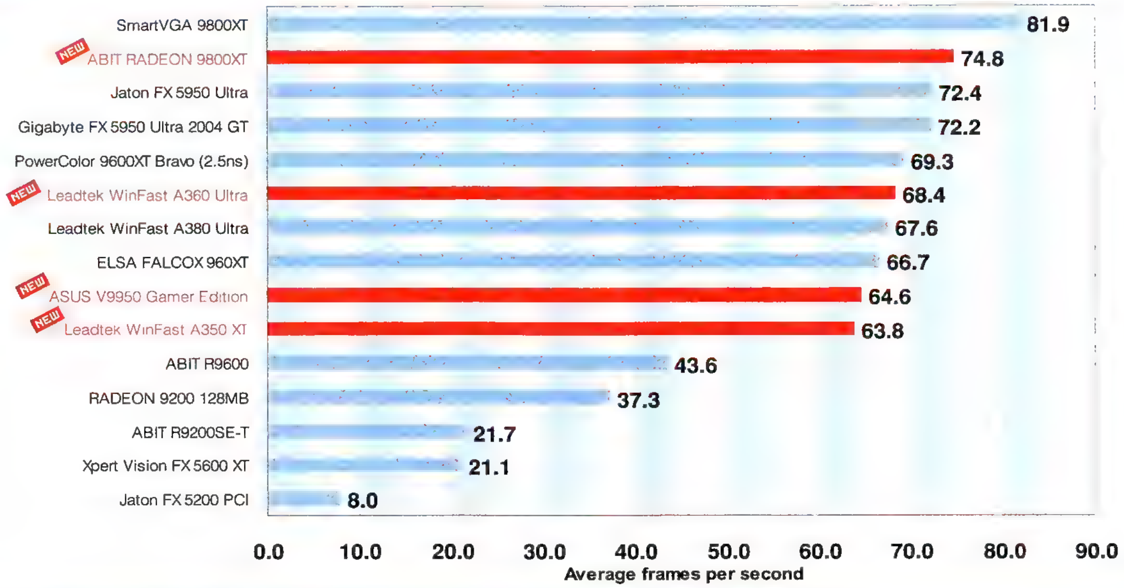
Specifications: NVIDIA GeForce FX 5900; 128MB 128-bit DDR RAM; 400MHz dual RAMDACs.
Core speed: 400MHz
Memory speed: 700MHz
Price: $539
Supplier: Synnex
www.synnex.com.au

At default speeds this card is not particularly exciting, and as an FX 5900 core, it's expectedly so. However, overclocking seems to be this card's best quality. We bumped the core clock up to 510MHz and the memory to 800MHz. Nothing exciting, but this gave off a far better result in CoD, spurting out 72.4fps. Unfortunately, that's still not enough grunt – but as John mentioned on the previous page, around 72fps seems to be CoD's roof limit for the current selection of cores and our testbench 3200+ CPU.

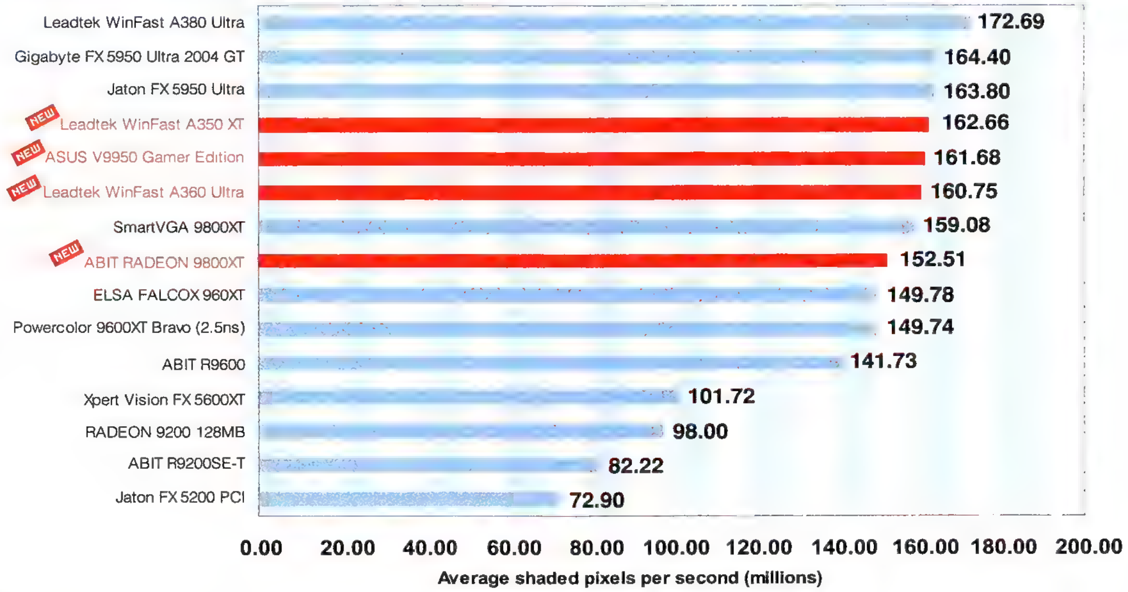
ASUS
www.asus.com.tw

Time machine, only used thrice - www.whattheheck.com/ebay/timemachine.html

Call of Duty



Aquamark 3



Video cards

The next generation is almost upon us. In head to head this month we took a look at the competing RADEON X800 and GeForce 6800 architectures, but the big question is when will we see the cards in retail, and what will they cost?

The first cards based upon the 12 pipeline versions of the new cores should start appearing next month, and thanks to ATI's habit of releasing presentations with speakers notes attached we can say that the RADEON X800 PRO has a target price of US$399 and when the 16 pipeline RADEON X800 XT ships in June it should have a US$499 price tag. NVIDIA's 16 pipeline GeForce 6800 Ultra is also set to debut at US$499, while its 12 pipeline GeForce 6800 is due to cost a meagre US$299.

We suspect that supplies will be very tight, especially of the 16 pipeline cards. This is down to the huge numbers of transistors on each chip and the potentially low yields that come hand in hand with such complexity.

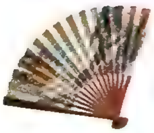
CPUs

Tumbleweeds are still blowing through CPU town at the moment as AMD and Intel continue to look towards socket changes in the near future. AMD has released a new high end Athlon 64 FX-53 chip and Intel has its 3.4GHz Extreme Edition, but apart from that they have been quiet on the product front.

AMD has made an announcement that its Dresden FAB-30 has gone into production of 90nm Athlon 64 chips. These chips mark the long awaited introduction of Silicon On Insulator (SOI) technology, using the IBM developed SIMOX technology. These chips are due to ship in the third quarter of this year and hopefully AMD will be able to avoid the huge heat output problem that Intel has faced with its 90nm Prescott core.

Apart from that, all eyes will be turning to Computex in the first week of June, where we should finally get to see the new Socket T LGA 775 Pentium 4 and Socket 939 Athlon 64 CPUs in the next generation of motherboards that will support them.

FSP GROUP



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Albatron FX5700U3

Probing GDDR3, Nathan Davis discovers an anticlimax and yawns.

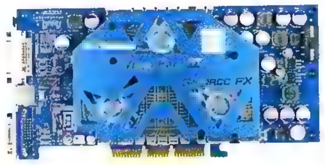
Supplier:
Australia IT
www.australiait.com.au

Website:
Albatron
www.albatron.com.tw

Phone:
Australia IT
(03) 9543 5855

Price:
$330

Specifications:
GeForce FX 5700 Ultra; 478MHz core clock; 128MB 950MHz effective 2ns GDDR3 on a 128-bit bus; extra power required.

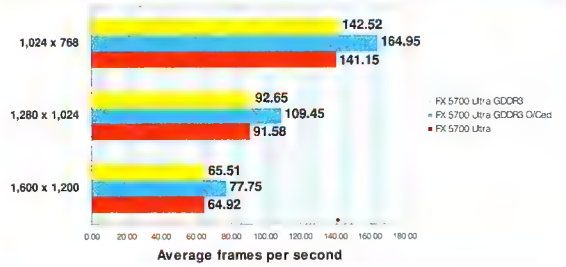


This otherwise ordinary looking GeForce FX 5700 Ultra card (aside from the blue PCB, bright blue LED and three 'Wise' fans – right, ordinary) is one of the first of many to be equipped with the new video card DRAM step up from GDDR2, unsurprisingly named GDDR3.

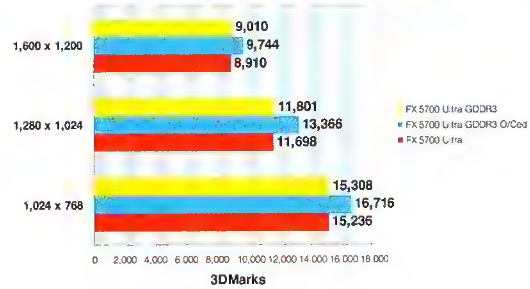
When GDDR2 entered the market, a major 'selling' point was the ability to have on-die termination. That is also a benefit of GDDR3, however GDDR2 was only used in extremely small amounts by NVIDIA, so the technical benefits are more obvious between the more commonly used and original GDDR, seeing as GDDR3 will in fact be used extensively on new NVIDIA boards.

The development process on GDDR3 was led by ATI but it is an entirely open standard. With full JEDEC ratification, what development ended up with was a module that could reach far higher frequencies using far less power, like the already mentioned on-die termination. Basically, this requires less power hungry circuitry and register packs. A GDDR3 module itself, however, is not physically different (to the naked eye) to a GDDR2 module – it's still in BGA form and still sits on a matrix of 144 balls.

Unreal Tournament 2003

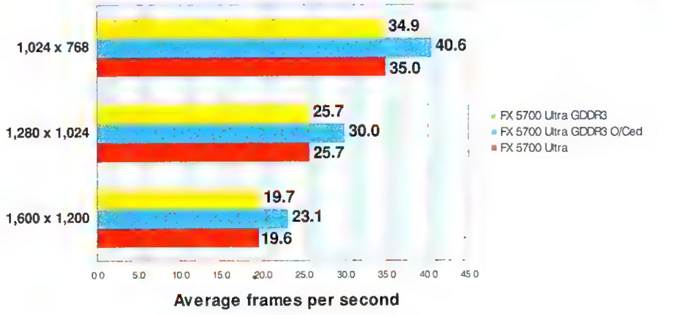


3DMark2001SE Pro



One of the more exciting things about GDDR3 is how the data is stored. According to spec sheets, it saves on 20-25 percent of power as current is now no longer needed for the memory to store logic state 1. Then of course there's the higher frequency capacity – it has more headroom to play with, rated at 500-800MHz (this card is 2ns, so 500MHz). And there are plans for GDDR4 to reach 1.4GHz.

Codecreatures Benchmark Pro



Just peachy, but money-wise is it worth upgrading to a GDDR3 equipped card? As you can probably tell by looking at the charts, GDDR3 has made no difference at all, and the minor disparities were only due to the chaos factor simply not allowing for perfect comparisons. This also accounts for the interesting fact that Albatron's FX 5700 Ultra core clocks in at 478MHz as opposed to the 5700 Ultra's 475MHz. The cards are identical in all areas of performance, so this was likely done in a vain bid to somehow differ from the pack. Funny, really...

With higher clocks being the advantage of GDDR3, naturally we pushed it as far as we could. We managed to bump the memory up to a stable 560MHz (from a raw 475MHz) and seeing as we were overclocking, the temptation was too great to bump the core up to 570MHz (default 478MHz). We couldn't push this card any further – higher frequencies resulted in either the card halting up or a collection of nasty artefacts. A clock of 1.12GHz sounds pretty trippy, but it does zip for performance.

GDDR3 will eventually come into its own and we'll wonder what we ever did without it but that's a little while off for now. For this generation of hardware, GDDR3 is nothing more than a marketing ploy. There is no performance increase that's worth noting.

Booming onto the market with an extra creamy vanilla slop of goodness, if marketing gets its way, GDDR3 will be the only deciding factor in which card you'll get. Well, it's all a pile of donkey doodie and our testing shows just that. Even with the GDDR3 memory upgrade, this card has no added benefit to the purchaser. If you're after a new card now, whether or not it has GDDR3 memory shouldn't be a buying factor.

This is simply an ordinary FX 5700 Ultra card. ND

SCORE 4/10

Segway – http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=/netahtml/srchnum.htm&r=1&f=G&l=50&s1=5971091.WKU.&OS=PN/5971091&RS=PN/5971091

Gigabyte GeForce FX 5700LE

Nathan Davis whips out this pseudo-quasi-plasmatic gaming entity.

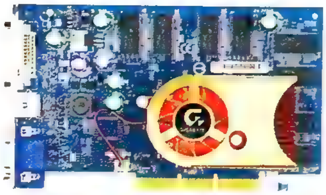
Supplier:
Rectron Electronics
www.rectron.com.au

Website:
Gigabyte
www.gigabyte.com.tw

Phone:
Rectron Electronics
(03) 9561 6166

Price:
$218

Specifications:
GeForce FX 5700LE;
250MHz core clock on a
.13-micron process;
256MB 400MHz 5ns
DDR on a 128-bit bus.



Budget cards are fast increasing in useable power, with far more capable cores surfacing. And the FX 5900XT is a top example of such a card. No longer do you have to put up with long slideshows of how to equip a melee weapon.

The FX 5700LE budget range is a cut down version of NVIDIA's NV36 chip, the FX 5700 (which is a cut down NV35, or FX 5900).

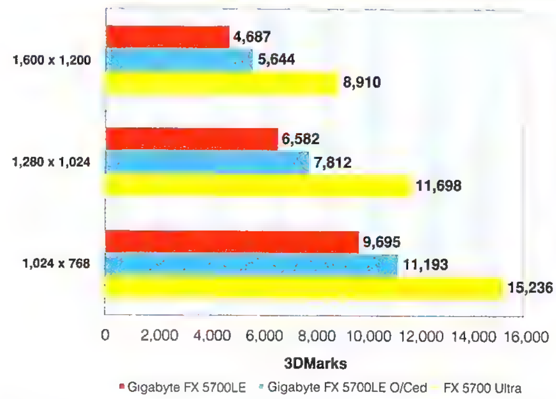
The technical specs between a standard 5700 core and the LE are significant. The LE has a hugely reduced core of 250MHz and cuts down the memory lane with 400MHz. We're talking close to 9200SE frequencies right here – incredibly low for a 5700.

This new card has 256MB of memory, which is sizeable for such a slow budget card. There is also a 128MB version of this card, but its memory bus only runs at 64-bit.

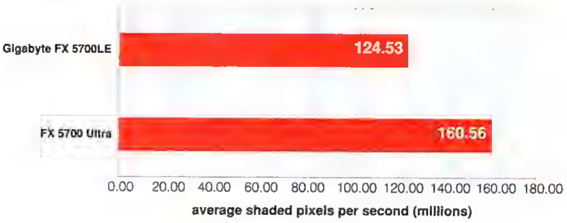
Cutting costs also involved something that most manufacturers are doing now – swapping the BGA memory out for the far cheaper and slower TSOP modules. These are the slowest we've seen in a while, hovering in at 5 nanoseconds (consequently, these are rated exactly at a max of 400MHz). Interestingly the pixel pipelines haven't been reduced, so it still has four pixel pipelines like the other FX cards.

Gigabyte pimp this card with 'rock-solid stability for next-generation games', and that's completely true. Keyword here: stability – not performance. Pegging it against a GeForce FX 5700 Ultra card (475MHz / 900MHz), you can see it performs at far less than average. For pixel shading, Aquamark 3 showed a massive drop, falling lower than that of a 9600 card. The minor overclock we managed to squeeze out (289MHz/483MHz) was definitely worth it, delivering a consistently more impressive frame count.

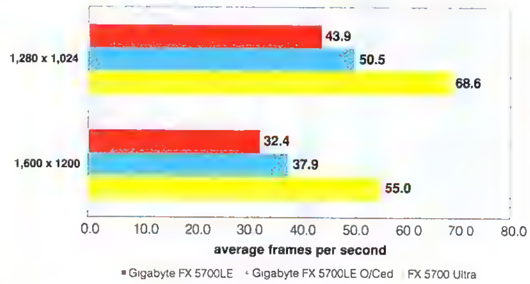
3DMark2001SE Pro



Aquamark 3



Call of Duty



So, is it for games? It's reasonable, but not nearly fast enough to warrant it as an adequate gaming card. It performs almost on par with a standard ATI 9600 card, and that's not the first card to check out for gaming. Mediocre, even for a budget card. So the answer's no.

The noise levels on these cards are probably the main worry; a surprisingly loud Jack Russell with excessive revs for its size and serious lack of heat. That bugged us. Suffice to say, the fan could have been made significantly quieter than its current level of auditory pandemonium.

Apart from NVIDIA's spanky new FX 680-cored beasts, the FX 5700 was the only NVIDIA core to sport a 0.13-micron process. As with ATI's 9600 series, this enables quieter and faster performance.

But why on this card? It's stupidly slow, and as a result readily cool. The nut grabber is it doesn't include Low-K dielectrics, which is why we could only push it so far (hence the small 39MHz core increase).

The 256MB of memory really isn't needed on the 5700LE – if a game *were* to come along with such high demands, you wouldn't be using this particular card. However, don't opt for the 128MB version of this card for games either, as the 64-bit memory bus will have you tearing your hair to tatters. This card is suited for Home Theatre but there are far better and quieter cards out there which are cheaper and just as suitable, like a 9200SE.

Not too bad for games, with an almost half decent framerate, but no surprise it's lacking in power. Damn cheap but if you want superior gameplay, you'd be better off spending a little more on the far quieter, train rocking FX5900 XT. That's NVIDIA's sweet spot. **ND**

SCORE

5/10

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ICQ: 27736587
Email: sales@scorptec.com.au

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Saturday: 10am - 3pm
Sunday: Closed

EverCool WC-201 WaterCooling kit

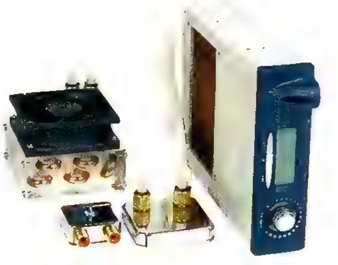
Supplier:
Altech
www.altech.com

Website:
Altech
www.altech.com

Phone:
Altech
(02) 9735 5655

Price:
$165

Specifications:
Water cooling unit for Socket 478/A/940 and GPU; 5.25in control bay with internal radiator, reservoir, pump and control; aluminium radiator with 80mm fan; cooling block with copper base.



The original idea for water cooling was to have a system that was both quiet and cooled far more efficiently than just fast moving air molecules. Like a Quentin Tarantino movie that only makes sense after the nth watch, it seems far too many manufacturers are making water coolers *worse* than HSFs.

Cooling both CPU and GPU, the WC-201 was made to be fully housed inside your machine. The reservoir, pump, first radiator and speed control were all thrown into a tight space, all thanks to a 5.25in box. Then there's a second radiator that attaches where your box's exhaust fan would otherwise go. Note that hardly any air makes it through the crammed maze of pipes and fins on this second radiator.

The worrying thing is that the first radiator fan sucks air from above and blows it down over the copper fins underneath. That goes against all commonly known laws of physics, and to top it off, EverCool recommends the user whack it up at the top of the case. This is to stop the 4°C rise we found occurred when there's a drive directly above it, with all of several millimetres of space above the stupidly installed intake. This also means you're cooling with heated air that doesn't have a chance in monkey land of actually cooling down. Ingenious.

Installation was pretty easy with no problems of leakage at all, but it fell to hell for everything else. With the ambient room temperature at 24.5°C, we clipped it to Chernobyl with the Socket A adaptor pumping out the standard 80W of heat.

The slowest fan speed clocked up an unimpressive 55°C but the faster, while aurally closer to a screaming concord, only managed a measly 54°C. This is the defining trait of a truly dicky design. Compare this to the 53°C the average performing Jet 7 HSF reaped at full speed – which is quieter – and this noisy water slosher doesn't win any respect.

Even with two radiators, it's, temperature-wise, the highest scoring cooling system we've tested in a long while, and will only get worse inside a hot case. If it's louder and hotter than a heatsink, what exactly is the point? ND

SCORE **0.5/10**

Zalman Reserator 1

Supplier:
Altech
www.altech.com

Website:
Altech
www.altech.com

Phone:
Altech
(02) 9735 5655

Price:
$350

Specifications:
Water cooling unit for Socket 478/A/940; 6.5kg 59cm tall blue anodised pure aluminium radiator/ reservoir/pump; 447g cooling block with gold-plated copper base (ZM-WB2 Gold); water flow indicator.

This is the sort of device we love to see – it's truly unique and redefines bold. Towering in at 59cm, the Reserator 1 is a completely silent water cooling kit and would have to be the most courageous processor cooler (can cool both CPU and GPU) we've ever looked at. Holding up to 2.5 litres of water, the blue anodised aluminium finned tower also contains the pump.

Considering its construction, it was surprisingly configurable and the option is always there for you to rip out the existing 5W 300L/h pump and throw in your own beastly external water thruster. The well documented manual even covers this.

Easy to install, we used Chernobyl with the Athlon adaptor pumping it to 80W at an ambient room temperature of 26.5°C. In the breeze-less labs, this heat monger managed 54°C. That's highly respectable for a passive cooler in a warmish climate with no airflow.

As it's completely passive, the cooling efficiency relies heavily on the location of the reservoir. You have to remember it will collect the strongest temperature that's available, so don't stash it under a desk. Prop it near an open window, in a cool room or somewhere where there's a less-than-warm breeze. Otherwise, you're going to have yourself one omni-directional grill heater. When we whacked a 120mm silent fan nearby, it almost instantly dropped to 49°C, so this shows how beneficial a breeze is.

The only problem we could find was the Flow Indicator dribbled a tiny amount of water around the main fixture every now and then. Some silica solution would easily amend that.

hotaward

The Reserator 1 fully fulfils its purpose: useable cooling for a completely silent 'computing experience'. It's certainly aimed at a niche market, but with the increase in popularity of home theatre PCs, people will want more power and a silent machine. This is just what the genius ordered.

Though a little pricey, it's beautifully engineered, looks like your very own industrial pet tower and its noise level is equivalent to that of a stomping Dermatophagoides Pteronyssinus – even pressed up against it, you can't tell it's on. Whet your fantasy moat – imagine rocking up to a LAN party with this. ND

SCORE **9/10**

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We don't mean the good ol' days of driving around industrial estates looking for unsecured Wi-Fi connections, we mean anywhere. With the wonder of GPRS it has been possible to get slow-arse net connections like this, but thanks to Hutchinson's 3 network the possibility of high speed data anywhere has arrived.

While it has been possible to use a 3 handset as a modem, the newly released NetConnect PCMCIA card allows you to pack your laptop with a 384Kb/s UMTS modem in the effort to reach those lofty goals anywhere you can get a 'true' 3 signal (known in marketing speak as being in 3's 'video zone'). If you can't get the signal, then the NetConnect card defaults to a 40Kb/s GPRS connection using Vodafone's network.

If you can pick up a UMTS signal then this card is astonishingly quick. That's if you can pick up a signal. In our testing around Sydney, transfer speeds varied from a lightning quick 40KB/s to an arsey GPRS connection of 6KB/s.

The pricing plans are good compared to other providers but still expensive; 3's top end plan is 100MB a month for $150, with each KB costing 0.4 cents thereafter. However reading the fine print of the plans turns up a very important factoid to consider; only 25 percent of that data usage can be on the GPRS network, with every KB after that being charged at 0.2 cents a KB.

Considering the spatially variable coverage of the 3 video zone this is highly important. If your home base is in a GPRS area then you could be in for bills much higher than you expected, even if you do manage your usage well.

While the 3 NetConnect card is pretty damn cool from a technology standpoint, it's held back by data rates well below what us power users have come to expect.

If you spend most of your time lurking in a 'video zone' and can suppress the leeching urge, then it enables you to enjoy the internet as it's meant to be, but for now it requires vigilance to stay under the data cap. JG

SCORE **6/10**

BenQ FP 767-12

Supplier:
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www.benq.com.au

Website:
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www.benq.com.au

Phone:
BenQ
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Price:
$899

Specifications:
17in TFT; 1,280 x 1,024 native resolution; 12ms response time; 140 degree horizontal/vertical viewing angle; 260 cd/m2 brightness rating; 500:1 contrast ratio; RGB D-Sub; stereo speakers; 37.7 x 40.5 x 9cm; 4.5kg

BenQ's brand new release of the FP 767-12 TFT has one highly important specification going for it – it features a fast (12 millisecond) response time. We looked at the Samsung SyncMaster 172X in issue 39 (*page 52*) which is the first 17in TFT *Atomic* has reviewed with this specification, and it rated highly. Enter the BenQ with similar specs but a much lower price: how does it stack up?

Before we get into how this FP 767-12's response time translates in the real world, it's worth looking at the rest of its specifications. While the BenQ's bezel is much larger and more conspicuous than the Samsung's, the bottom portion features some tiny stereo speakers if you need 'em.

It's the specifications that make this monitor really shine though, and that's where the FP 767-12 shows its excellence. It features a 260cd/m^2 brightness rating and a high 500:1 contrast ratio, plus it has a native res of 1,280 x 1,024 and fairly wide viewing angels.

Its underlying electronics translate into awesome colour and greyscale reproduction, and there were no noticeable aberrations or problems. This is one of the clearest, most defect-free screens I've ever looked at – there were no pixel timing or phasing problems, colours were uniform and details sharp and focused across the entire display. What's more, the 12ms response time made for fabulous DVD and gaming playback.

While it's cheaper than the SyncMaster, the BenQ FP 767-12 hasn't got the Samsung's pixel warranty. BenQ will only replace the screen outright when there's any single defect in the centre ninth of the display, with a repair/replacement policy only swinging into effect when there's at least eight defects on the rest of the screen.

Regardless, it's now becoming all too clear that when you are shopping for any brand of TFT it's wise to get the low-down on precisely how each manufacturer's warranty works – and don't necessarily take the shop assistant's word for it.

That said, the BenQ FP 767-12 is one of best and most vibrant TFTs to come along in quite some time, and it really gives CRTs a run for their money. DE

SCORE **8/10**

Plasma lightsabre – www.futurehorizons.net/saber.htm

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If your *Art*omic entry is chosen for show in the magazine, you'll win a copy of combustion 3, a nifty composition app from our pals at discreet (www.discreet.com). As a bonus, all entries are automatically eligible for the grand prize of 3ds max, the best 3D program ever. The winner will be announced at year's end. All you have to remember is that all *Art*omic pieces need to be original and hardware- or games-based.

Send your art to:
artomic@atomicmpc.com.au

illustration by www.engine.com

Games

When the game's up

How does it feel to be smack dab in the middle of a revolution? Logan Booker puts down his pitchfork and whips out his deck.

I've always been a big fan of card games. When I was 10, I entertained the folks with magic tricks. When I was 12, I played the odd game of poker. At 15, I was the grand master of 500, Hearts and Gin; an unstoppable force at clubs that oozed refinement in spades. But despite my cut-and-shuffle finesse, it wasn't until the innocent age of 17 that the kids at school finally stopped beating me up and calling me girl's names for playing cards. They coerced me into more manly sports, like softball, jump-rope and netball. Though these terrifying experiences are now behind me, every time I reminisce, I can't help but contemplate if my childhood could have been more… interactive.

At the core of any game, be it a friendly match of poker with a stacked deck, or the regional finals of under-16s netball, is fun. We all play games for fun, our excitement driven by the challenge to one-up our opponent in a quasi-gladiatorial dance of pseudo-death. Games are also an excuse to be social, in a way that isn't immediately social.

Early video games kind of killed that. Sure, there were all those '80s ads with happy-happy families hoarding around the warm glow of an Atari 64, but the truth is, they were all works of pure fiction.

In most cases, said console would find its way into the eldest son's bedroom, along with Dad's questionable collection of magazines and every scrap of sherbet that made its way into the house. We can fight it, deny it and ignore it, but in the end, games were seen as antisocial and uncultured, and as hazardous to one's chances of interpersonal gratification as undiagnosed Type 1 diabetes is to a sherbet-fiend.

From this, it could be argued that the rise of personal computers and gaming consoles has empowered a new generation – namely ours – to interact less, spurred it to spur less. What we have to keep in mind is that computers were a revolution, much like the arrival of industry in the 17th and 18th centuries. A vicious pace was set in the 1990s to keep up or be left behind. No one wanted to be by themselves like an unpicked team mate in a high school football match; we desperately fought to catch up like the evil runner bunny in those Duracell ads.

But in the end, they *were* alone. Many were. In fact, we all were. We isolated ourselves with our TRS-80s, Amiga 500s and 286s. Locked ourselves into gleeful solitude with Battle Squadron, Monkey Island and Doom. Hacked, cracked and attacked. My brain still subjects me to dreams of DFO: and 'Please wait, loading…', in between scattered moments of JetStrike and Defender of the Crown.

To this day, I still quote stuff from many a LucasArts game – much to my chagrin now that the Sam and Max: Freelance Police is but a requiem of a dream. Imagine not ever playing your favourite game. Guaranteed, you'd be a less interesting person if you'd never finished LeChuck's Revenge or valiantly tried (but ultimately failed) to 'clock' Impossible Mission.

All these experiences – the games, the mates, the late nights, the pizza, the Coke – bred inside of us unique personalities that are clued when it comes to perhaps the most influential aspect of modern life – the computer. For me, it started with something as mundane as a deck of cards, but we can look at everything we now know, and be confident that we're prepared for the next revolution, in whatever form it may manifest.

So, are games and computers to blame for this decade's social outcasts? Not really. We should remember that the computer revolution disgorged the internet, BBS, and eventually, the sanity-devouring entity known as AOL, or as my D&D buddies like to call it, the Gelatinous Cube of Instant-Messaging Services. With all this communication, millions of megabytes of data a day, how can we, if not the planet, not be better off for the lure games provided to the world of PCs?

Scanner

ShortCircuits

Interplay Entertainment Corporation, publisher of Fallout and Baldur's Gate, is currently fighting to stay in business after reporting an almost US$15 million capital deficit in December 2003. In addition, the company faces eviction from its offices in California, as well as a visit from the Internal Revenue Service if it is unable to pay some US$100,000 in arrears. With the company's future looking murkier by the day, one can't help but wonder where its famous brands, such as Baldur's Gate, will end up...

Staying with Interplay, there's news that Fallout 3 may see the light of day via an external developer; the news slipped during a conference call by Interplay's CEO Herve Caen. The game was canned a few months back, much to the surprise and disappointment of fans – especially since most of them weren't aware the game was in development! Caen also said Interplay no longer owned the rights to Baldur's Gate 3, and that the next Dark Alliance game would make use of a licensed engine.

Nokia has released the N-Gage QD, a cut-down version of the moderately successfully N-Gage. While it features a more compact design and a hot-swappable MMC slot, it's been stripped of the N-Gage's MP3 player and radio. It will be available in Australia from July.

BUZZWORDIKAN

BRDF

Bi-directional Reflectance Distribution Function describes how light from particular materials appears when reflected off a surface. The micro-geometry of the material determines the actual light-surface interaction. It's the change in the light behaviour of the material as the lighting vector changes with respect to the surface.

Anti-gravity device – http://jnaudin.free.fr/html/lftphv.htm

BELOW: ATI's diamond shader in action.

Oh, the maniacal magic of the annual Game Developers Conference! Breathe the air, it's saturated with droplets of inspiration! James Wang has all the gossip.

Exhilarating E3 may be, with its huge crowds, lucrative contracts and booth babes, but GDC is where game making is the heart of the show. And this year's conference, held in March and dubbed 'Evolve', aimed to elevate all aspects of game creation.

ATI and NVIDIA both took the opportunity to give seminars and presentations on new rendering techniques using current and upcoming hardware. The stench of NV40 and R420 was heavy in the air.

For the last two years or so, *Atomic* has preached that hardware features (dedicated blocks of silicon to draw specific effects) were becoming extinct. The latest GPUs will serve as the proof of this.

In the past, new graphical effects were announced as part of new hardware; you needed to buy a Matrox G400 to get shiny water or a 3dfx Voodoo 5 for motion blur. Not so today. At GDC '04, ATI and NVIDIA showcased dozens of new effects from diamond shaders to light shaft renderers. And with generalised shaders, all new graphical features in the future will come from software, not hardware.

ABOVE: NVIDIA demos a new depth-map scattering technique to simulate marble transparency.

John Carmack, id's lead programmer, gave his first keynote at GDC. He talked about the exponential increase in computing power as well as development cost. In effect the first has inevitably led to the second. Carmack said that computational power had increased by about a million-fold since the early days of video games. The task of mopping up all this power has shifted the bottleneck from hardware to the artists. Referring to Wolfenstein, Carmack said, 'there were shipping maps that were done in less than an hour, and they worked. But when we look at things now, when it takes man-months before a map gets to the playtest stage, I worry.'

The task of art creation has now become such a problem that Carmack considered options of remaking old games using new technology. JW

Unreal Engine 3.0

The third and latest build of the Unreal Engine was demoed for the first time to the public at GDC. And yes, it out-leaps Doom 3's graphical glory. Doom 3 is designed around the hardware capabilities of the GeForce 1, a DirectX 7.0 class GPU. The latest Unreal Engine is a true next-generation design in that its minimum spec is DX9.0 and it offers absolutely no support for older architectures. The feature set of the new engine is staggeringly long. Pervasive use of 64-bit colour rendering allows the engine to elegantly reproduce many natural effects such as lenticular halos and light blooms.

Most feature names quickly become tiresome to hear, but we certainly haven't come across 'holographic texture mapping' or 'spherical harmonic lighting' before. While the first may just be bump mapping on steroids, the second is definitely treading on the doorstep of global illumination.

Holographic texture mapping, also known as virtual displacement mapping, addresses the flaw that bump maps only look correct when viewed face-on. With holographic texture mapping, as you change your angle of viewing, not only will the lighting change, but the base texture will also be re-sampled to reflect the parallax change. That is to say, if you look at a brick wall from side on, the bump map will cause the shader to re-sample the base texture such that the bricks seem to physically bulge out and occlude the cement. Previous techniques would have shown equally visible brick and cement areas.

Spherical harmonic lighting gives rise to the possibility of a realtime BRDF (see Buzzwordican) with internal reflectance properties. It's expected to make a big showing in many upcoming DX9.0 titles. JW

Developer Quote of the Month

'Mention the absence of support for overflow and underflow too – since it makes you look knowledgeable.' 'Point out that you have an animated logo! How cool is that?'

Speaker notes from ATI's leaked GDC 2004 presentation.

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S.T.A.L.K.E.R. redux

After playing S.T.A.L.K.E.R. and meeting with developer Oleg Yavorsky, James Wang discovers game technology that casts a shadow over all others.

When Engine Room debuted in *Atomic*, the first engine we looked at was S.T.A.L.K.E.R. because, at the time, it featured the most exciting technology. Almost a year later, we still feel much the same way. So you can imagine the shock that hit us when the developers told us we were looking at dated technology – what's been shown in public so far was using the DirectX (DX) 8.0 rendering path, the team has been working behind the scenes on a brand new DX9.0 engine to be unveiled at E3 (The Electronic Entertainment Expo) this year.

The reason for two different paths is a simple one, related to the speed of hardware evolution. When DX9.0 compliant hardware arrived, it was widely accepted by gamers for its speed, and developers for its ease of programmability. Thanks to new high-level languages such as Cg and HLSL, very complex shaders could be written and run on existing game content in little time. This gave birth to the concept of having multiple rendering paths within a single game, one for the past generation and one to take advantage of the newest. Those who had experienced the days of 'software rendering' versus 'hardware rendering' will certainly feel the nostalgia.

For the DX9.0 path, S.T.A.L.K.E.R. focuses on three things: soft shadows, high dynamic range and light-material interaction. The first is familiar: using DX9.0 shadow mapping techniques, a plethora of algorithms have been devised to create accurate soft shadows. These shadows are only affected by dynamic lights and hence fall into the hybrid lighting solution, much like most games today. The second, high dynamic range rendering (HDRR), is much more interesting. Every screenshot we've seen up until now was calculated using 32-bit colour. With DX9.0's full fledged support for up to 128-bits of precision in floating point format, the range of light intensities can now be millions of times greater. Although the developers were reluctant to tell the specific uses of HDRR, an educated guess would point to water, metallic surfaces and perhaps indoor to outdoor transitions.

The most striking element we found about S.T.A.L.K.E.R. was the game's unique synergy between art and graphics. That is to say, the engine has the uncanny ability to use the same features found in other games and make them look so good that it seems some secret technology must be at work. We asked Oleg Yavorsky, senior PR manager at the Ukraine-based GSC Game World how it achieved such feats. He recalls, 'Right at the beginning of the project when we realised the X-Ray [engine] can handle a way higher polycount and texture size than other engines in comparison, the designers were given a task to make the picture on screen look as realistic as possible.' The portal-style engine with full hardware geometry support certainly helped but the real juice was in the textures: 'On top of that, we used and continue to use the principle "all that can be photographed MUST NOT be hand-made." Why waste precious time drawing obsolete brickwork if it is already done for us by builders and nature? The trip to Chernobyl generated a huge amount of photo and video material that was used as a basis for realistic graphics.'

ABOVE: xxx

The irony of photorealism

In the old days, when graphics, animation and physics were all but symbolic, games were amazingly immersive. Unfortunately, all the advancement in 3D technology has done little to increase this immersion but have often decreased it. One very immediate problem facing photorealistic games is that a tiny flaw in physics or animation destroys the whole illusion of reality. This is much more severe today than it was a few years ago. Is there a solution?

Yavorsky is not making bets: 'Yes, we do realise all aspects of the game should be as good as graphics. Otherwise, people constantly tell us that, they say animations or some other game elements don't look convincingly realistic; even though they are way better than in many modern games. However, with the graphics in the background they lose out, which causes inner discord for the player. He starts realising there is something spoiling the overall picture. It is difficult to come up with a universal method of overcoming this problem. The only way we can think of is to thoroughly bring all game compounds up to ideal.'

But other developers have also used photo-based textures and they were not so successful, could this just be luck? 'We were fortunate only in one thing,' Yavorsky says, 'that is, we managed to gather a group of highly talented programmers and artists at the right time.'

Perhaps highly talented is an understatement. High resolution textures have been around for a long time. 2,048 x 2,048 textures were made available in hardware as early as 1999 with the TNT2. While games using high resolution textures certainly look 'sharp', one couldn't actually say they looked 'real.' The textures in S.T.A.L.K.E.R., on the other hand, are mostly based on photos (rather than hand painted) and when used in-game, yield almost 3D-like results. From peeling paint to metal rivets – areas where other games have become reliant on fancy bump mapping – the artists for S.T.A.L.K.E.R. simply used photo-textures and an acute artistic sense. 'It's all about correct processing of the photos to be used in the engine, high-quality shadows, high polycount on the models and some visual tricks,' says Yavorsky.

Let there be light

Despite how much we adored the exquisite texture work, the real show stopper was actually in the sky. Although games have greatly advanced in lighting technology, one crucial light that has received little attention is the sun. Not anymore: 'we tried to reproduce the day and night cycle as

ABOVE LEFT & ABOVE: Outside, inside – the engine cares little. No matter where you are, everything is rendered in striking detail.

ABOVE: Lighting, tech and nature come together to create a high level of realism.

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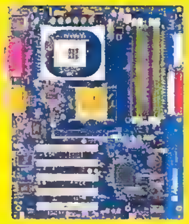

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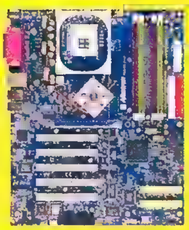

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Albatron

LEFT & ABOVE: Conceptual sketches are key in any game to fully realise characters.

accurately as possible to make dusk, dawn and sun movement look pretty much realistic. Speaking of the sun, it is certainly a main source of light in our outdoor environments. Shadows from all objects and living creatures change depending on their position in the sky.'

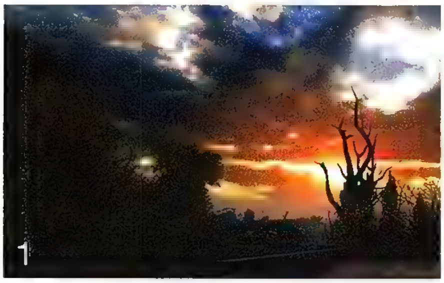
But it's just one bright light, you may think, what's the big deal?

The big deal is that unlike previous efforts at time transition, which simply made the world brighter or darker, S.T.A.L.K.E.R. has set out to express this in terms of physically correct shaders. Although to be fully correct would require global illumination, a task not remotely possible in realtime and something Pixar is only starting to come to terms with, clever approximations can work wonders. The first step was in making the sun a true light in the sense that it casts correct shadows for all game geometry and it moves correctly with time transition. Yavorsky demonstrated this by altering the time lapsing parameters in game. While the pace of the game remained constant, he sped up the day-night transition to as fast as a cycle per minute. 'The engine utilises a TXT file containing all information on the sky, fog, lens flares, sun texture with glow texture, rain, lightning etc used at specific time,' he said. 'For now you can manually edit this file to set parameters of the sky condition.' So in theory, you can sync a S.T.A.L.K.E.R. game to the real world. Set speed as 'realtime' and head to bed. When you wake up, you'll be able to see a sunrise both at your window in real life and through your monitor, in the Ukraine – provided you survived the night.

The second task is making sure the colour of the world is consistent with the transitions of the sun and atmosphere. 'This is almost a correct lighting model,' Oleg explains. 'You will never confuse dawn for midday bright light or crimson shades of sunset.' We saw it with our own eyes and indeed the whole game changes. Be it the towering pines, rolling tundra or desolate buildings, everything is inescapably saturated by the rays of the sun. At midday it glows white hot, rendering the sky a deep, crisp blue. At sunset, it radiates a warm and pleasant orange, soothing the whole world into a shimmering passing.

We can go on and on: projected lights, post filters, ODE physics – S.T.A.L.K.E.R. has more niche features than we can count with both hands. But of course, the number of features is beside the point; S.T.A.L.K.E.R. actually makes good use of the technologies rather than just 'supporting' them. On a closing thought, we pitched the stories of Duke Nukem Forever and Half-Life 2 to Yavorsky. After all, those games were shaping up to be great too, how can S.T.A.L.K.E.R. not slip down the same path of eternal feature-creep?

'We have no intentions whatsoever to delay the release,' Yavorsky declares. 'We are fully aware that every month there will be new projects with interesting ideas and attempts to implement them in our game will lead to never-ending development. Ability to envisage what a game will be called for in two to three years and set a correct objective in line with that is by all means the most important condition of success.' JW



1: The shifting sun provides a source of in-game lighting.
2: Photography is key to environment detail.
3: The sun rises over a rival Stalker.

Ninja Gaiden

John Gillooly prances like a ninja in a gaiden.

XBOX

Specs

Developer:
Team Ninja
www.team-ninja.com

Publisher:
Tecmo
www.tecmoinc.com

Distributor:
Microsoft
www.microsoft.com

Phone:
Microsoft
13 20 58

☺ Fast, fluid ninja action. Gorgeous environments and stunning cut scenes.

☹ Camera sometimes descends into the realms of wonky. Damn hard at times.

ABOVE: Anything that outnumbers you in arms and eyes deserves to die.

After the pretty but somewhat gameplay-free DOA: Beach Volleyball, we thought Team Ninja had descended into a competition with Paul Steed for best rendering of cleavage in a game. But our concerns were blown away seconds into one of the best spray and pray games of recent years – Ninja Gaiden.

A sequel of sorts to the Ninja Gaiden games on the NES many years ago, this 3D hack and slash with puzzle elements conjures up similarities with a lot of titles of recent years like Onimusha and Devil May Cry. However Team Ninja has managed the tricky task of keeping the gameplay fluid and fast without any compromise to playability.

The game focuses on Ryu Hayabusa, a ninja given the task of returning the stolen Dark Dragon Blade and avenging his clan. This entails a lot of challenging combat, some downright nasty boss battles and a bit of platform jumping.

It is the fluidity of combat that makes this game shine and, unlike most games of this type, combat requires more than just dextrous button bashing.

You need to think a few moves ahead and be constantly aware of your surroundings, especially during the epic battles with end of level bosses. It can be hard and frustrating at times, but finally smacking down an evil uber-samurai makes it all incredibly worthwhile.

Most games of this type are let down by poor in-game camera views, and at times this problem rears its head in Ninja Gaiden.

However, this general trend is apparently more a difference between Western and Japanese game audiences than poor development, so it is unlikely that the perceived issues with cameras will ever actually be fixed to our satisfaction.

Ninja Gaiden achieves that rare combination of gorgeous graphics and deep, challenging gameplay. It seems impossibly hard at times, even on the normal difficulty setting, but all this does is make the game even more rewarding.

Quite simply, Team Ninja has managed to create one of the best titles to grace the Xbox.

hotaward

SCORE 9.5/10

Counter-Strike: Condition Zero

Terrorists win. Allison Reynolds plays bot e-training.

PC

Specs

Developer:
Valve
www.valvesoftware.com

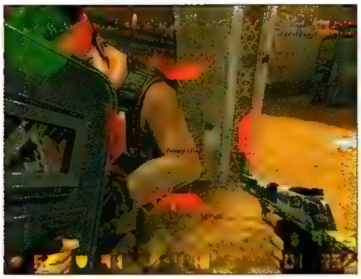
Publisher:
Sierra
www.sierra.com

Distributor:
Vivendi Universal Games
www.vugames.com

Phone:
Vivendi Universal Games
(02) 9978 7722

☺ 'Watch out I am dangerous!'

☹ Wall shooting, corner camping, bad aiming bots.



ABOVE: Shields have never been so arousing. You'll be fighting them off!

Necrophiliac (noun): one who enjoys sexual contact with corpses. See also Counter-Strike: Condition Zero player.

I loved Counter-Strike; I started playing many years ago. Since then I, and most of the gaming world, have moved on. Alas Counter-Strike: Condition Zero has not.

It is sad to see a game that was great for its time now being milked for every last drop of player loyalty. Sad like seeing Keith Richards still playing in the Rolling Stones and sad like Shane Gould's comeback.

After the initial rush of nostalgia while playing the first campaign set in de_dust, I found little about the game new or exciting. In single player mode CS:CZ is a series of missions that require you to complete tasks of escalating difficulty. Some tasks make little sense, eliminating a terrorist with a sniper rifle in a confined room map for example. Others are overly easy and can be done in seconds.

You don't complete these tasks alone – handpick your AI team mates from a motley crew whose skills improve as you complete missions.

Be choosy as they can be infuriatingly dense. Given a rescue hostage task, the bots will mow down any terrorist they find, rather than escorting you and your entourage back to the safe point, thus ruining the whole mission.

Bots also enjoy lobbing grenades at you and disobeying your orders. They do, however, have a fairly good vocabulary; announce where they are and spout some funny one-liners.

After the recent spate of games with superior graphics, it came as a shock to see there hasn't been much improvement from several years ago. Those with lower spec PCs can rejoice as the requirements to run CS:CZ are for machines at least two years old.

CS:CZ is quite short, the Deleted Scenes section has a linear storyline to carry it along a bit further, but not far enough. For gamers who have never played CS, this game will be an excellent entry point before braving it online with the dreaded Steam. For those that hoped for something special after many years of changes and revamps, you will be sorely disappointed. CS:CZ would have been better off buried.

Requirements
PIII 500 MHz; 96MB RAM; 16MB video card.
Recommended
PIII 800; 128MB RAM; 32+ MB video card.

SCORE 5/10

Amphibious sulky single horse drawn light vehicle – http://v3.espacenet.com/textdoc?CY=ep&LG=en&IDX=FR2694256

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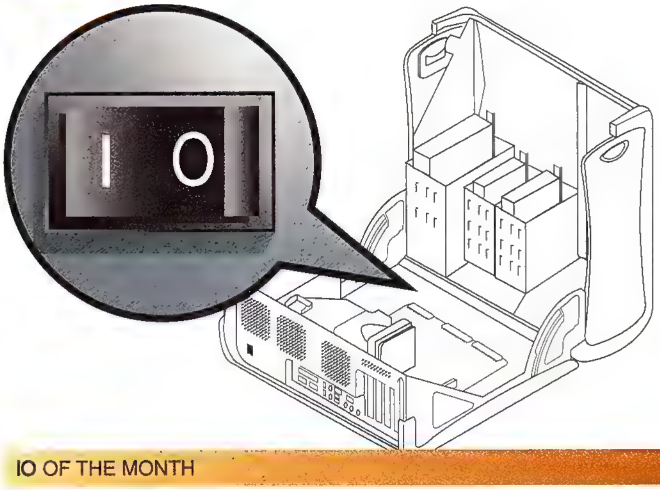


IO of the month wins a Logitech MX700!

Hey ma! It's optical and wireless and all!
io@atomicmpc.com.au

IO OF THE MONTH

CPU giblets

How do differently clocked CPUs actually differ in terms of manufacturing? I mean, what do Intel and AMD do to make the higher clocked chips, besides just raise the core multiplier? It's not like they re-engineer the entire chip, as it's the same architecture and all. I thought that maybe all they do is test the threshold of the chips and those with a higher threshold get a higher stock operating speed.

Also, what is the core multiplier? I mean, I know what it does, and that the FSB multiplied by the core multiplier gives the resultant operating frequency. But what exactly is it? When the multiplier is changed what physical... thing... happens to make the operating speed that factor more?

Liam Willetts

You've pretty much figured out the deal with CPUs of different speeds. Every CPU of a particular type (a particular core, amount of L2 cache, etcetera) *can* end up packaged as the very top-spec version, if all goes well, and if the CPU manufacturer needs it to be.

All does not go well all the time, though; chip fabrication is a tricky business, and not every chip on a given silicon wafer is going to be the same. The chips are tested before the end of the packaging process, and classified according to the speed they manage to run at. Some don't work right even at the minimum speed for their product line, so they're thrown away. Most chips pass the test for one grade or another, and are usually then packaged up accordingly.

Some chips, however, pass the test for high speed, but are packaged as a lower speed chip, simply because there are orders for *x* many of those lower speed chips and the fabrication process happened to turn out more high speed chips than were needed. Sometimes practically every chip at a given speed grade actually passed the test to run much faster – see the classic old Celeron 300A, for instance, or the Pentium 4 2.4C.

The mechanics behind the multiplier are more complex. Inside the CPU there's a phase locked loop (PLL) circuit that uses two dividers.

Put (relatively) simply, the FSB clock is applied to one input of a frequency comparator, the output from which drives a voltage controlled oscillator (VCO). The VCO is the actual configurable gadget which, left to its own devices, spits out approximately the right core clock frequency for the CPU.

The VCO can't be trusted to get it quite right, though, so its output is fed through the two dividers (two dividers let you have fractional multipliers; older processors that only handled integer multipliers have only one divider) that're set to the right ratio to recreate the bus clock from the VCO's output, assuming the VCO output is exactly right.

The output from the dividers goes to the second input of the frequency comparator I mentioned above. This closes the loop in the PLL; the comparator controls the VCO's input, and compares the VCO's divided output to the FSB speed it's supposed to perfectly match, and tweaks the VCO input if it doesn't. The circuit can thus very rapidly settle onto pretty much the exact frequency the processor's meant to run at.

> 'Some don't work right even at the minimum speed for their product line, so they're thrown away. Most chips pass the test for one grade or another, and are usually then packaged up accordingly.'

Screen translation

Is it possible to connect an LCD from an unused notebook to a desktop PC, to use as the main display?

Rivai

Possible, yes. Practical, probably not.

A few companies sell interface adaptors that let you connect various kinds of LCD panel to normal video signals, including RGBHV ('VGA'). The adaptors aren't very cheap, though; you can expect to pay at least US$200 for one, maybe US$250.

Examples:
http://earthlcd.com/controllers. htm

The adaptor isn't all you need to make the panel into a monitor, either; you need some kind of casing, of course, and you also need a power supply. Even if you don't put a value on your time, all of this pushes the price of the resultant contraption up pretty close to that of a brand new regular 15in 1,024 x 768 LCD monitor – which is probably the best you can expect from your ex-laptop setup, since adaptor boxes for higher resolution panels are hard to find.

If the laptop's an old one, you're unlikely to want to stare at its screen all day anyway. If it's a new-ish one, consider networking it to the main PC (wirelessly, if you like!) and using VNC (www.realvnc.com) or Windows' Remote Desktop to make the portable into a *remote* monitor, and keyboard, and mouse!

Dash, plus, backslash, tilde...

I just bought a DVD burner that does both DVD-R and DVD+R, and no one can tell me the difference between the two types of recordable DVDs. Can you shed some light on this?

Chris Dooley

The difference between the 'dash' and 'plus' recordable DVD formats was important when the technology was

○ Horse-powered car – http://v3.espacenet.com/textdoc?CY=ep&LG=en&IDX=GB1405575

younger, if only because you had to make sure that cheap spindle of discs you bought on eBay were compatible with your drive.

Today, though, cheap drives read and write both flavours, and the only remaining difference is that DVD-R is slightly more likely to be legible in any given DVD-reading device. It's hard to make good stats on compatibility because of the range of different drives and media out there, but there's a quite comprehensive and up-to-date survey at CDR-Info: www.cdrinfo.com/Sections/DVDMediaFormats

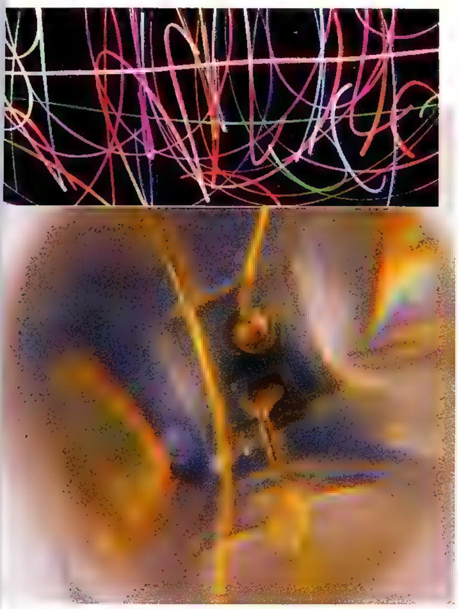
It says that DVD-R compatibility is about 97 percent, while DVD+R manages about 87 percent.

Disco mouse

I have a Microsoft Optical Mouse Blue, and I got the idea of modding the light in the mouse. I am just wondering, is that an LED, and if it is, is it possible to change it without affecting the optical mechanism?
Andrew Stewart

Yes, it should be possible. People have even found that despite the operating voltage difference between red and blue LEDs (less than 2.5 volts, versus around 3.5), you can just swap a blue one right in and have it work at decent brightness.

The only risk you run here (besides accidentally destroying your mouse with a soldering iron...) is that the little camera in the bottom of the mouse expects to be looking at a surface lit by a red LED, and may not be as sensitive to blue light. This may make the mouse more prone to skip on surfaces that it worked fine on before. Again, though, people who've done this trick with various mouses generally don't report problems when using the mouse on regular mousemats or other high-contrast surfaces.



ABOVE: Triple-die two-wire LEDs make it easy to add fabulousness to any device.

Note that if you've got a mouse with a second, decorative LED shining out the back (the Blue mouse has one, as do many other IntelliMouses), you can change that LED to a different colour with no chance of causing tracking problems.

There are even triple-die red-green-blue LEDs in standard twin-lead 5mm packages, now, which include a tiny flasher/chaser controller right there in the package. They'd be no good as an under-mouse light, but would be particularly trippy as a tail light!

Wonderful wire

I was wondering if there was a real difference in quality between the standard HD15 VGA cables and BNC cabling. I was just given a 19in Sony GDM-400PS, which has both inputs, and I was wondering whether it's worth paying for BNC cables.
Nathan

A *good* BNC lead will give you a sharper picture at very high resolutions. A bad one won't do anything worthwhile. It's perfectly possible for a bad BNC lead to give you a fuzzier, ghostier picture than a good HD15 lead would. If you want to see the kinds of problems I'm talking about, buy the cheapest HD15 extension cable you can find and plug it in.

There's not much point to using BNC for monitors smaller than 19in. You can just start to see some difference in 1,280 x 960 on a decent 19in screen, especially if you're running a high refresh rate (like, 100Hz).

1,280-by-whatever at 85Hz (the sweet spot for the GDM-400PS) might be high enough for the difference to be apparent. Don't expect anything dramatic, though, unless the cable you're using at the moment is unusually lousy.

Modem of mystery

I am one of the unfortunate people who, thanks to www.telstra.com, are still light years behind in the broadband revolution, even though people living 100 metres away can get ADSL. So I am stuck with a shitty 28.8 connection.

My download speed is usually around 3Kb per second, however, when I downloaded this file http://telstrawholesale.com/products/docs/access_broadband_minimux.xls the speed was a whopping 9Kb/s. How is that possible?
Tim

ABOVE: There's no super-chip; if it's a 28.8Kb/s modem, then it's a 28.8Kb/s modem.

It's very highly compressible data. Your modem, like every other modem for a lot of years now, does v.42bis data compression by default; that reduces the fatness of data passing between your modem and the one at the ISP's end of the line.

Usually, v.42bis doesn't achieve much. It'll squish HTML data quite successfully, but things like JPEG and GIF images, and most separate files people download, are already compressed and have no more 'air space' in them.

That uncompressed Excel file, however, can be zipped down to less than 10 percent of its uncompressed size, so v.42bis can compress it considerably too. The most compression the v.42bis algorithm will ever manage is 4:1, but you're seldom likely to see more than the 3:1 you just got.

Note that if Telstra had zipped the Excel file *themselves*, you would have got it even faster, ignoring the time it would have taken to unzip it at your end. V.42bis wouldn't have made the zip file any smaller, but there would have been a tenth as much data to download in the first place.

I've written more about this sort of thing here: www.dansdata.com/sbs33.htm and www.dansdata.com/io028.htm.

DR

Simon Peppercorn exposes neato shortcuts in My Computer.

Each of these tweaks involves a trip to the registry. For all versions of Windows, this is done by running 'regedit' from the command prompt. The pagefile tweak will need regedt32, however.

For each registry tweak, there are three things you need. The Data Type, the Value Name and the Value itself. A new String Value appears as a REG_SZ type, a new Binary Value appears as REG_Binary. A new DWORD value is REG_DWORD, a new Multi String Value as REG_MULTI_SZ and a new Expandable String Value as EXPAND_MULTI_SZ

How to really turn NIC on

Many network interface cards (NICs) are built with an onboard processor, which in an ideal world eases the processing burden of the CPU when it uses the NIC. Oddly enough, this function isn't enabled by default, so we need to switch it on. Browse to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters and if it doesn't exist, create a DWORD value and name it DisableTaskOffload. Give it a value of '0', then reboot.

Stop crawling around

One of the default behaviours of both Windows XP and Windows Server 2003 is that it starts trawling for resources once a network connection is established. We can turn this off in: HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Advanced by changing or adding the REG_DWORD value with the name NoNetCrawling. A value of '1' will disable the function, '0' will turn it back on again.

You don't have to use the registry to achieve this. In an Explorer window head to Tools | Folder Options | View, and un-check option to 'Automatically Search for network folders and printers'.

Expose all you can

If you wish, it is possible to add a bunch of extra icons in your My Computer folder. Drill down to HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\MyComputer\NameSpace and add a new key for each of the following Class ID values:

{D20EA4E1-3957-11D2-A40B-0C5020524153} : Administrative Tools
{2227A280-3AEA-1069-A2DE-08002B30309D} : Printers and Faxes
{D6277990-4C6A-11CF-8D87-00AA0060F5BF} : Scheduled Tasks
{7007ACC7-3202-11D1-AAD2-00805FC1270E} : Network Connections
{D20EA4E1-3957-11D2-A40B-0C5020524152} : Fonts
{645FF040-5081-101B-9F08-00AA002F954E} : Recycle Bin
{208D2C60-3AEA-1069-A2D7-08002B30309D} : My Network Places

Use a pet name

Within Windows 2000 and Windows XP, it is best practice to have the pagefile sitting on a separate physical hard drive, for performance reasons. Using regedt32 (not regedit) you can also change the pagefile name and location:

Under HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\Session Manager\Memory Management, change the PagingFiles value. As this is a MULTI_SZ data type, you can create a list of values. So, for this tweak, specify the path and name of where you want to put the pagefile and specify a size in MBs.

Don't be clumsy with your hands

That cursed Windows Start key – the one between your ctrl and alt keys – is useful or it isn't. Some love it, but many are clumsier with it than a drunk elephant and would love to disable it. All they need to do is head to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Keyboard Layout and create a binary type value name of Scancode Map give it a value of : 00 00 00 00 00 00 00 00 03 00 00 00 00 00 5B E0 00 00 5C E0 00 00 00 00. Then the obligatory reboot should disable it nicely.

Sometimes you need four fingers, not three

Shutting down and restarting your 'puter manually is a pain in the arse. We can create a keyboard shortcut which allows a quick reboot from within Windows itself using a Shift-Ctrl-Alt-Del combo.

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\WindowsNT\CurrentVersion\Winlogon and create or modify a DWORD with a value name of EnableQuickReboot and a value of '1'. How easy is that?!? Oh... don't forget to restart.

MSN warning

I personally hate that condescending reminder each time I launch a chat session in MSN that tells me to be careful with credit card details, blah blah blah. That little splash screen can always be edited with something relevant.

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\MessengerService\Policies is where you need to be. Create an SZ Value with the name IMWarning, and give the value any text you wish to display, such as 'be careful what you say for who knows who may read your logs'.

If you want to remove the message completely, give the IMWarning a value of a single space " ".

Don't be shy and don't block everything

One of the problems I have faced when people sent me attachments is that Microsoft Outlook kindly blocked most attachments as a security precaution. As grateful as I am to Microsoft for thinking of me personally, I actually needed some of those attachments.

It turns out that in HKEY_CURRENT_USER\Software\Microsoft\Office\10.0\Outlook\Security for Office XP or HKEY_CURRENT_USER\Software\Microsoft\Office\11.0\Outlook\Security for Office 2003 I can create an SZ value with the name 'Level1Remove' and for the value, specify the extensions I don't want Outlook to block. These extensions need to be separated by a semicolon. Eg: .bat;.cab;.css;.dll.

But sometimes it's better if it doesn't always pop-up.

Hey cool, Windows XP Service Pack 2 includes a pop-up blocker for Internet Explorer. It just seems it has to be manually turned on for it work. No matter. Under HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\New Windows create a RE_SZ value with the name PoupupMgr and give it a value of '1'. Joyous!

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Peter Sbarski welcomes you back for another installment of Linux Tweaks! Let's get tweaking...

Servicing Linux

Windows XP has a built-in utility, we all know and love, called msconfig. Among a number of features it lets the user specify which services are allowed to run at startup and which aren't (actually services.msc is better suited for this task). Fortunately Linux has a couple of utilities that make the management of services just as easy and, at the same time, a lot more powerful and effective.

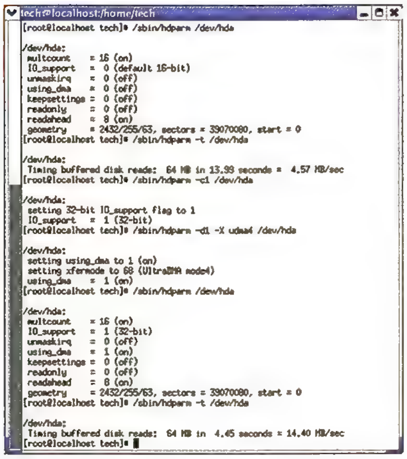
To see which services are currently enabled, run: */sbin/chkconfig –list|more* (see figure 1). The numbers in the output specify run levels for which the service will either be turned on or off. Now, to turn off a service for a specified run level, execute: */sbin/chkconfig —level {levels} {service name} {on|off|reset}*. For instance, to turn off *wine* and free a bit of memory, try this: */sbin/chkconfig —level 5 wine off*. Now you can make a killer script file that will turn off or on different services depending upon your need. Don't forget that you must be root to do this and to reboot for the changes to take effect.

The chkconfig utility is pretty easy to use but there is one thing to be wary of: dependencies. Turn off random and you will find that a lot of programs don't work. Be careful.

Finally, to see which services are currently stopped and which are running (including pids) use: */sbin/service —status-all*. To restart a stopped immediately service, try: */sbin/service {service name} start*. To stop a service, simply replace *start* with *stop*. These changes will only be valid for the current session.

Linux unlimited

In Linux the process and shell resources allocation mechanism can be controlled using the ulimit command. To see the current resource allocation use: *ulimit -a*. You can change hard limits by using the appropriate flags. For instance, to change the number of files that can be opened at any one time from 1,024 to 5,000, try this: *ulimit -n 5000*. To get rid of the limit altogether, use the flag *unlimited*. For example: *ulimit -u unlimited*.



```
[root@localhost tech]# /sbin/hdparm /dev/hda

/dev/hda:
 multcount    = 16 (on)
 IO_support   =  0 (default 16-bit)
 unmaskirq    =  0 (off)
 using_dma    =  0 (off)
 keepsettings =  0 (off)
 readonly     =  0 (off)
 readahead    =  8 (on)
 geometry     = 2432/255/63, sectors = 39070080, start = 0
[root@localhost tech]# /sbin/hdparm -t /dev/hda

/dev/hda:
 Timing buffered disk reads:  64 MB in 13.99 seconds =  4.57 MB/sec
[root@localhost tech]# /sbin/hdparm -c1 /dev/hda

/dev/hda:
 setting 32-bit IO_support flag to 1
 IO_support   =  1 (32-bit)
[root@localhost tech]# /sbin/hdparm -d1 -X udma4 /dev/hda

/dev/hda:
 setting using_dma to 1 (on)
 setting xfermode to 68 (UltraDMA mode4)
 using_dma    =  1 (on)
[root@localhost tech]# /sbin/hdparm /dev/hda

/dev/hda:
 multcount    = 16 (on)
 IO_support   =  1 (32-bit)
 unmaskirq    =  0 (off)
 using_dma    =  1 (on)
 keepsettings =  0 (off)
 readonly     =  0 (off)
 readahead    =  8 (on)
 geometry     = 2432/255/63, sectors = 39070080, start = 0
[root@localhost tech]# /sbin/hdparm -t /dev/hda

/dev/hda:
 Timing buffered disk reads:  64 MB in  4.45 seconds = 14.40 MB/sec
[root@localhost tech]# 
```

ABOVE: A few simple commands and more than a triple jump in performance.

Copy man and watch

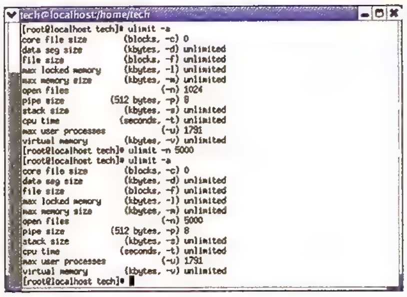
If you want to copy a man page to a text file *man ls > ls.txt* will not do. Instead try this, *man ls | col -b > ls.txt* and it should work.

Watch is an interesting command that automatically and repeatedly (you can set any interval) runs one command and displaying its output. There are many things you can do with *Watch*, for instance, to watch what's happening with your files in realtime in the current directory try this: *watch -n 0 ls -C*.

Speeding drives

A lot of Linux distributions are very conservative in their initial settings and it is up to you to change them. Here is how you can optimise and 'speed-up' your hard and optical drive performance.

By default Red Hat 8 (and other distros) only enable 16-bit I/O support across the PCI bus.



```
[root@localhost tech]# ulimit -a
core file size        (blocks, -c) 0
data seg size         (kbytes, -d) unlimited
file size             (blocks, -f) unlimited
max locked memory     (kbytes, -l) unlimited
max memory size       (kbytes, -m) unlimited
open files                    (-n) 1024
pipe size          (512 bytes, -p) 8
stack size            (kbytes, -s) unlimited
cpu time             (seconds, -t) unlimited
max user processes            (-u) 1791
virtual memory        (kbytes, -v) unlimited
[root@localhost tech]# ulimit -n 5000
[root@localhost tech]# ulimit -a
core file size        (blocks, -c) 0
data seg size         (kbytes, -d) unlimited
file size             (blocks, -f) unlimited
max locked memory     (kbytes, -l) unlimited
max memory size       (kbytes, -m) unlimited
open files                    (-n) 5000
pipe size          (512 bytes, -p) 8
stack size            (kbytes, -s) unlimited
cpu time             (seconds, -t) unlimited
max user processes            (-u) 1791
virtual memory        (kbytes, -v) unlimited
[root@localhost tech]# 
```

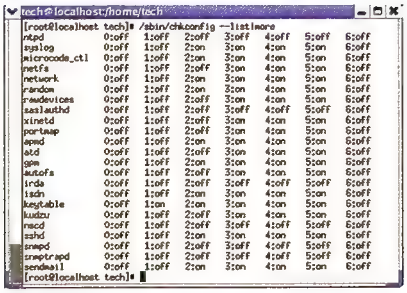
ABOVE: Tweaking ulimit.

To make it 32-bit execute the following: */sbin/hdparm -c1 /dev/hdX* (replace */hdX* with *hda, hdb</l>*, etc...).

You can always check whether your new settings are enabled by running */sbin/hdparm /dev/hdX* before and after the change.

To enable DMA transfers (some distros also don't enable it by default) run: */sbin/hdparm -d1 /dev/had*. There are different types of DMA transfers you can enable (slower or faster), for instance to get UltraDMA mode 4 working try this: */sbin/hdparm -d1 -X udma3 /dev/hdX*. To find out which UDMA modes your drive supports and other practical information try: */sbin/hdparm -i /dev/hdX*.

Unless your hard drive is very old you can enable IDE Block Mode. Using the -i flag, from above, look up the *MaxMultSect* value and enter the following: */sbin/hdparm -m 16 /dev/hdX* where *16* is the *MaxMultSect* you found for your hard drive.



```
[root@localhost tech]# /sbin/chkconfig --list|more
ntpd            0:off   1:off   2:off   3:off   4:off   5:off   6:off
syslog          0:off   1:off   2:on    3:on    4:on    5:on    6:off
microcode_ctl   0:off   1:off   2:on    3:on    4:on    5:on    6:off
netfs           0:off   1:off   2:off   3:on    4:on    5:on    6:off
network         0:off   1:off   2:on    3:on    4:on    5:on    6:off
random          0:off   1:off   2:on    3:on    4:on    5:on    6:off
rawdevices      0:off   1:off   2:off   3:on    4:on    5:on    6:off
saslauthd       0:off   1:off   2:off   3:off   4:off   5:off   6:off
xinetd          0:off   1:off   2:off   3:on    4:on    5:on    6:off
portmap         0:off   1:off   2:off   3:on    4:on    5:on    6:off
apmd            0:off   1:off   2:on    3:on    4:on    5:on    6:off
atd             0:off   1:off   2:off   3:on    4:on    5:on    6:off
gpm             0:off   1:off   2:on    3:on    4:on    5:on    6:off
autofs          0:off   1:off   2:off   3:on    4:on    5:on    6:off
irda            0:off   1:off   2:off   3:off   4:off   5:off   6:off
isdn            0:off   1:off   2:on    3:on    4:on    5:on    6:off
keytable        0:off   1:on    2:on    3:on    4:on    5:on    6:off
kudzu           0:off   1:off   2:off   3:on    4:on    5:on    6:off
nscd            0:off   1:off   2:off   3:off   4:off   5:off   6:off
sshd            0:off   1:off   2:on    3:on    4:on    5:on    6:off
snmpd           0:off   1:off   2:off   3:off   4:off   5:off   6:off
snmptrapd       0:off   1:off   2:off   3:off   4:off   5:off   6:off
sendmail        0:off   1:off   2:on    3:on    4:on    5:on    6:off
[root@localhost tech]# 
```

ABOVE: Be careful which services you turn off.

Note, that if you use a Live distribution like Knoppix, DMA is disabled by default. If you turn it on you will see a massive improvement in your hard drive and especially CD/DVD-ROM read/write performance. You can test the speed differences before and after by using this command: */sbin/hdparm -t /dev/hdX*.

TWEAK US HAPPY, YEAH!

linuxtweaks@atomicmpc.com.au

INGREDIENTS:

The choice of expansion hardware for Couch Potato: PowerColor RADEON 9600 Pro All-In-Wonder, Audigy 2 ZS sound card, Pioneer A106 DVD +/- R/RW, WD Raptor SATA HDD, as well as the following supplies which could only be sourced from these retailers at time of purchase. All prices were correct at the time of print.

PC Range,
www.pcrange.biz
- IOSS shielded IDE cable $29.00 RD3XP-A5K
- Minitar 802.11g wireless NIC, $109.00
- IOSS 80CM shielded audio cable RD3XP-CD8K $16.00

PC Case Gear,
www.pccasegear.com
- Noise isolator flex pad kit, $25.00
- UV power supply connector kit, $17.50

AusPC Market,
www.auspcmarket.com.au
- Chaintech DTT-1000 Digital Terrestrial TV Tuner card, $170.50

Anyware Computer Accessories,
www.anyware.com.au
- Lian Li Mobile HDD rack, RH-48SATA, $66.00

Tools'n'Stuff

- General hand tools
- Assorted heat shrink
- Cable loom
- Vinyl paint
- Zip-ties

The Couch Potato Project part 3

No time to slouch, get off the couch; grab a hoe and have a go at this oh grandly project. Join Ron Prouse about the house, as he finishes this great-great case, of light and magic dust!

This is the final instalment of The Couch Potato Project and, because it is really 'just another PC', most readers will already be comfortable performing many of the assembly tasks, such as fitting PCI cards and loading drivers. Therefore those parts will be quickly glossed over...

On the other hand, some of the things that are often only mentioned in passing by case builders, such as detailing of wiring and lighting, will be looked at with a bit more detail. The fact is, building something that looks great on the outside is the easy part – getting the inside looking just as slick and neat is another issue. When you consider that an average computer has nearly 15 metres of assorted cables and wiring jammed into its half-square-metre interior, it is easy to understand why many modders consider that achieving a 'wireless' look is next to impossible.

The other area that's worth investigating is effective lighting. The overall concept is not to emit more lumens than the midday sun, but rather to add lighting which will accent a particular feature of the case. After all, an HTPC is supposed to drive the television, not eclipse it!

DISCLAIMER

Power-tools, sharp objects, electricity and aerosol paints can be dangerous to your current state of wellbeing, so take care and follow all of the relevant safety precautions. Especially eye protection. This project may also contain a potential hidden danger, fiscal degradation, so observe 'wallet safety' at all times.

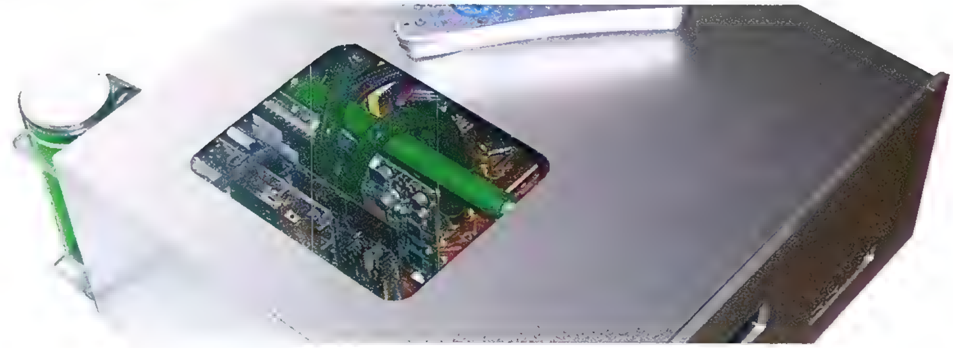
Safety is your responsibility, not AJB Publishing's.

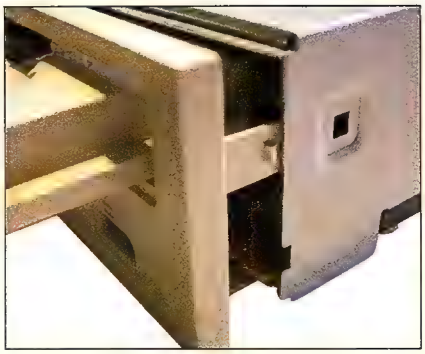
The final part of the Project, commissioning the software, is an area that will be dependent on your specific hardware. This will either be relatively simple or extremely challenging, depending on the video card that you chose, and whether you are using a PC-friendly data projector, 100Hz digital screen, or a low-res 1980s generic TV. (The latter would definitely be a test of your patience.)

This tutorial doesn't have enough space to address all of the above permutations, but one smidgen of advice is it's really worthwhile to spend a little extra money on a video card designed for this type of application; the choice here is the RADEON 9600 PRO All-In-Wonder. It ships with an IR remote and excellent HTPC software, including a simple Personal Video Recording (PVR) module. If you are working with limited funds, then remember that by using a tool such as PowerStrip (www.entechtaiwan.com) you can force most recent video cards into any suitable resolution and refresh rate.

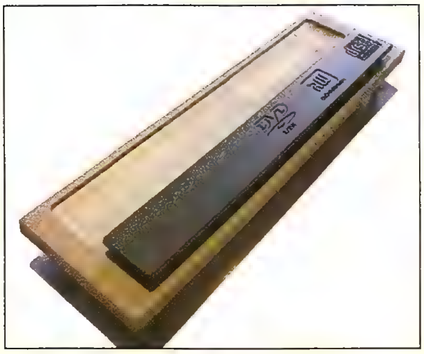
The real issue with configuring an HTPC is not the *potential* functionality, but making it actually meet your needs. Cut to the basics, building an HTPC is no different to building any other PC. The challenge begins when you start to integrate it with your other home theatre components. The world of consumer electronics is somewhat at odds to the conventions of the PC, and getting all the various pieces of the puzzle to work in harmony can be a bigger challenge than it appears. Be patient, it can be done!

BELOW: Green is good. Looks like grass, lime jelly, anime chick hair and *Atomic*.

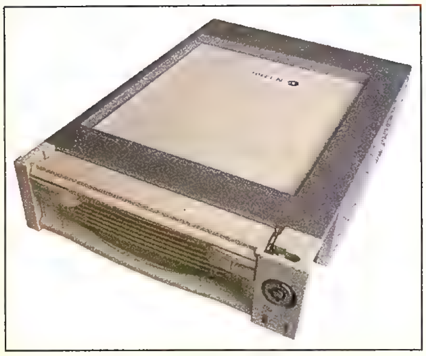




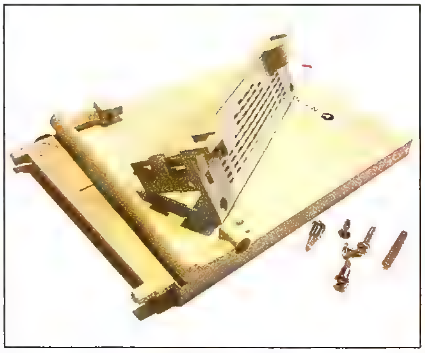
01 Painting plastic. The first step is to remove the fascias from the optical drive, a simple matter of removing the drawer 'cover' (open the drawer first!) and unclipping the lock tabs with a small screwdriver. The plastic should then be cleaned with a suitable solvent.



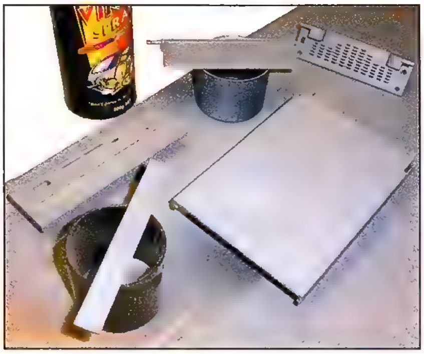
02 Mask off any rubber gasket that runs inside the fascia lip, as paint will degrade it and make it sticky. Test the colour and finish on a single 'plain' component first – sanding back one item is easier than having to strip the paint off everything if it goes pear-shaped.



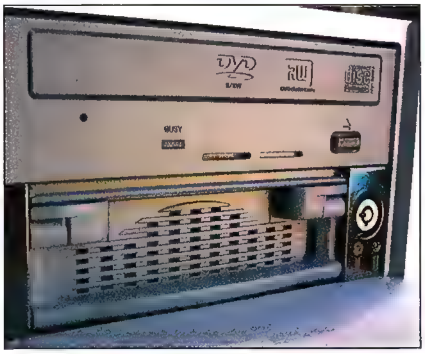
03 As well as adding portability and cooling, the Lian-Li removable HDD rack was chosen as an 'insurance policy'. Anecdotally, SATA connectors are proving to be fragile, and it is better to lose a $66 rack. As a bonus, the RH48SATA is a true ATA150 pass-through, not a converter.



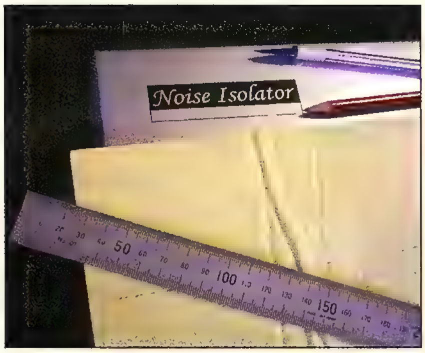
04 Achieving an OEM look when changing the colour of drives means stripping everything to its smallest component, and painting them separately. Unless you are a Jedi master with masking tape, that includes removing LEDs and buttons to avoid overspray.



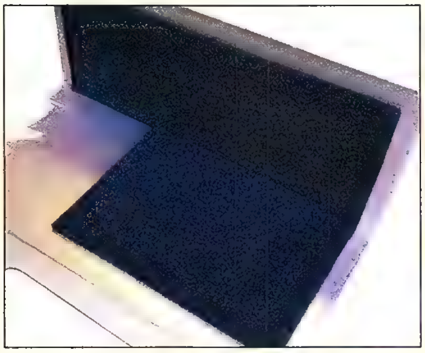
05 Vinyl dye, active component: Dimethyl ether. Make sure you have adequate ventilation or suffer the headache. Paint the components with several light coats, each from a different angle of direction to get an even finish in all of the 'nooks and crannies'.



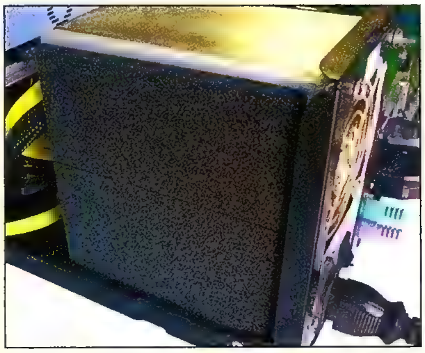
06 Once dry, reassembly is a straightforward bolt-up. If you have memory issues, taking pictures when stripping the components can be a saviour at this point. Rubbing the dyed finish briskly with a soft cloth removes excess surface residue and results in a soft sheen.



07 In an HTPC environment, silence is golden, so it makes sense to use ambient sound deadening material wherever possible. The noise isolator kit contains self-adhesive high density foam that is great value, with enough material even for large cases.

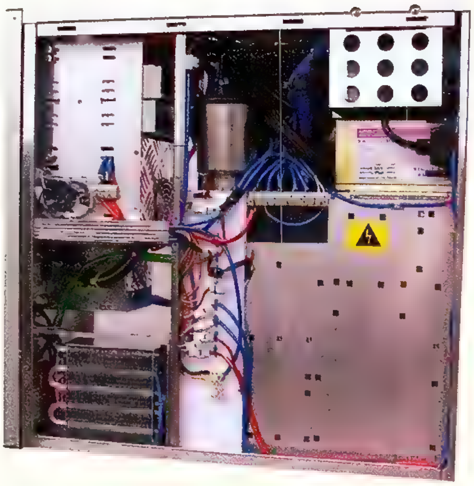


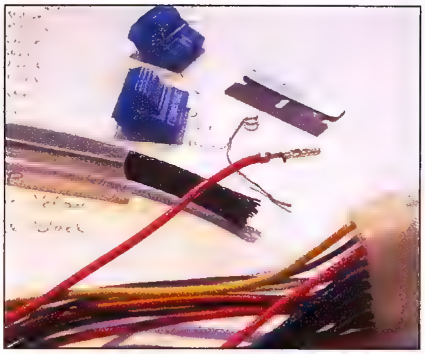
08 Installation is a simple process of measuring, cutting and sticking into place, making sure that the surfaces are clean and that you don't overlap chassis areas. For maximum effect, keep any joints butted hard against each other. The foam sticks to itself, so doubling-up thickness is possible.



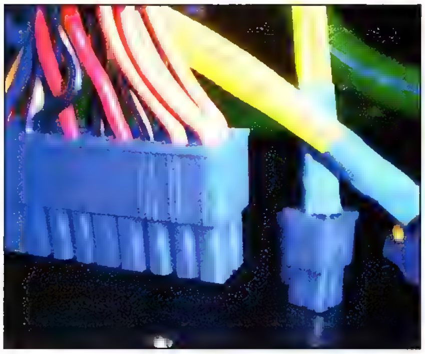
09 Don't just consider the outer case area for soundproofing, look at other areas that will be effective for reducing noise through dampening – especially the main fan source in a water-cooled system, the PSU. Just make sure not to block off any ventilation points that will affect cooling performance.

10 Hiding cables and wiring is an important step towards achieving a really impressive case mod – unfortunately it can also be one of the more frustrating experiences in life. The first step is to quantify exactly 'what' and 'where' needs power/data. When it comes to power wires, the easiest thing to do is make a loom from scratch, with connectors placed exactly where they are needed and the cable routed so that it's not obvious. The loom is then fitted with a male connector so that it can be plugged directly into the PSU. Data/sound cables can usually be concealed behind components, around the case perimeter or even hidden behind the mobo.



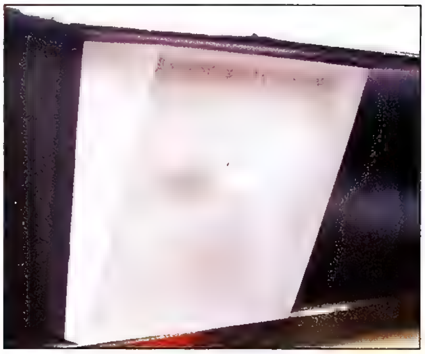


11 *Issue 39* had a tutorial on cable sleeving, but an additional point is worth mentioning. The ugliest power-block in a computer is the ATX lead. De-pinning this plug is straightforward, using a piece of wire to bend the barbs inward, similar to removing a Molex connector.



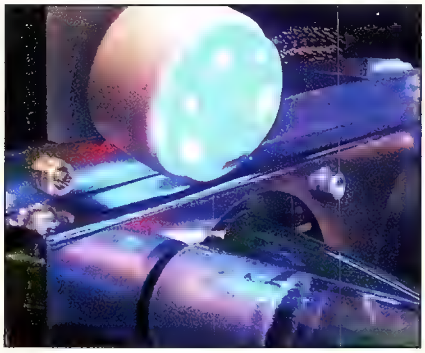
12 Once the ATX plug is removed, the wiring can be sleeved and the barbs bent back into position, ready to be pushed back in to the connector. Coloured UV reactive connector blocks help transform the look of the cabling into a feature.

13 The 'LazerLED Spotlight' is a new product that is perfect for highlighting. Not much larger than the original LazerLED 3-beam spread, the spotlight has six high-powered LEDs that are converged into a beam of light. Mounting is by adhesive pad on the base...

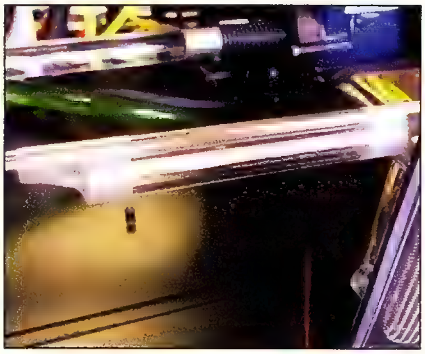


14 ... which means that the placement (and focus) is limited to flat surfaces. The answer is to fabricate an acrylic mounting bracket that 'aims' the beam where you want it to point. The mounting block is then drilled, tapped and screwed into place.

15 With a clear lens the beam was a little intense, so it was sanded with 1,200 grit sandpaper to partially diffuse the light. For consistency, the wiring was sleeved in black where it would be visible before entering the main loom.



16 The spotlight in position, shining down the length of the acrylic water-cooling delivery tube. When coolant is added into the system this will make the tube glow as if it is lit up from inside, and it will become the main feature of the case window.



17 Another cheap lighting alternative is the 100mm 'bare' cathodes available through Jaycar stores. The problem is how to mount them. This case had a steel reinforcing rod running across one end which in the perfect position! First step was to cut a section of acrylic tubing to length.

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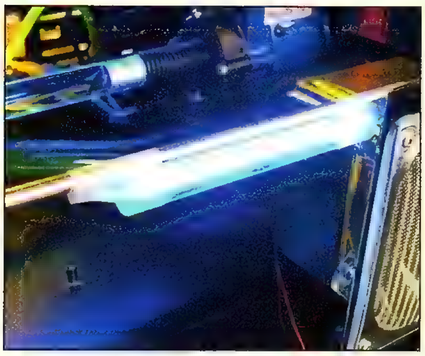
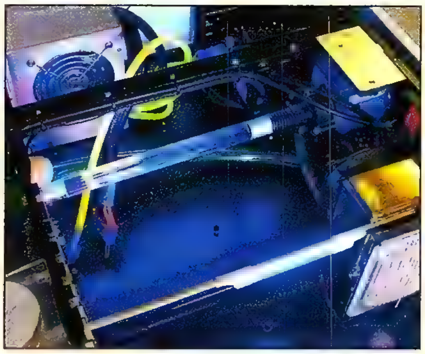
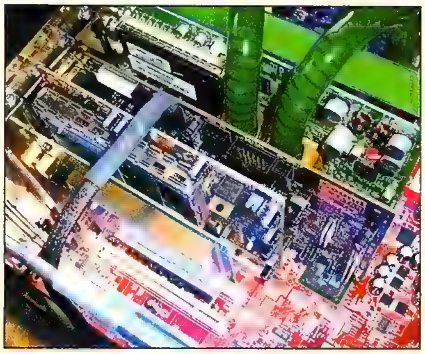


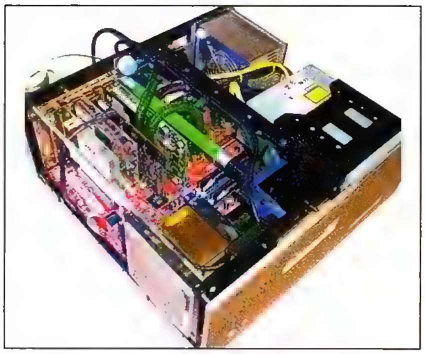
18 After securing the power wires to the light with clear heatshrink, which also helps in shock absorption, the 100mm cathode is slid inside the 10mm acrylic tubing. Two larger diameter pieces of clear heatshrink are then used to secure the tube to the case bracing bar.



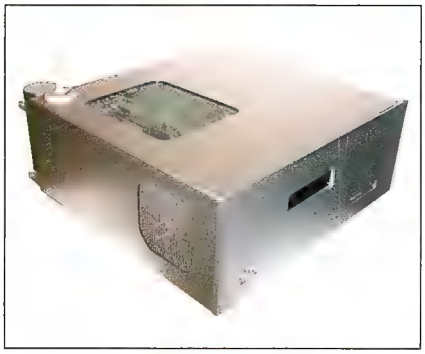
19 With the lighting and wiring loom in place the 'wireless' look is taking shape. IOSS rounded IDE and sound cables will be used, mainly due to their high performance delivery but also too because their black sleeved finish matches the rest of the loom.



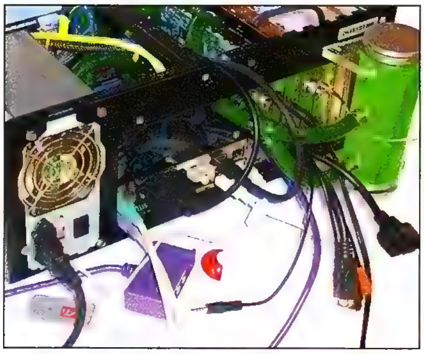
20 Installing the PCI cards. As well as the RADEON 9600 All-In-Wonder, there is an Audigy2 ZS, Chaintech Digital TV tuner and a Minitar 802.11g wireless NIC. Always install and load drivers for one card at a time – this makes diagnosing IRQ or driver conflicts much easier.



21 Once all of the PCI cards are in place, it's time for the final tidy-up of all the wiring. Check that all the wiring connectors are plugged in securely and do a final inspection of the water-cooling components for possible leaks.

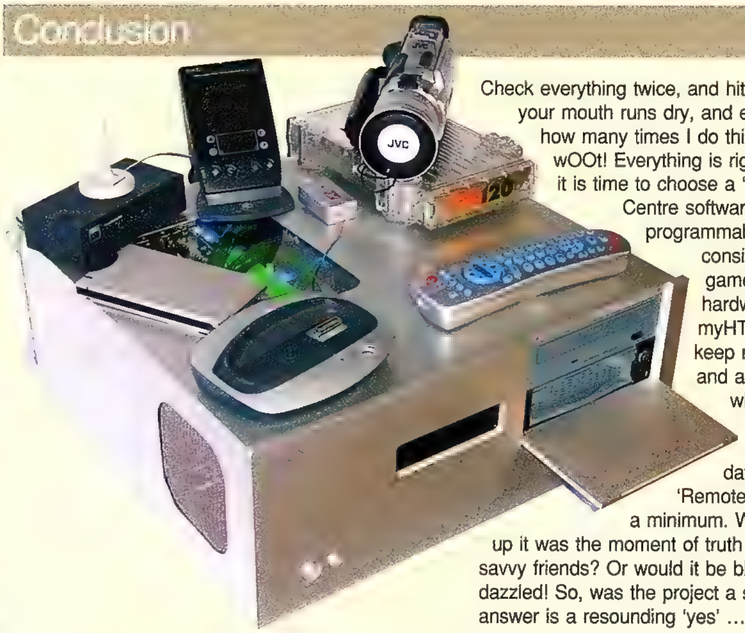


22 Remove all of the protective tape from the case covers and clean off any residual adhesive with a suitable solvent – on anodised aluminium it's quite safe to use acetone – and give the case a coat of car polish/wax to protect and enhance the finish.



23 It might look wireless on the inside, but the back-plane is a different matter. With two remotes, multiple format AV in and out, three aerial inputs and all of the additional peripherals there is a heap of wiring to sort through. Welcome to the world of home theatre connectivity…

Conclusion



Check everything twice, and hit the power switch. This is the time when your bum puckers up, your mouth runs dry, and every bit of your attention is focused on the monitor! No matter how many times I do this, there is always the fear of total system annihilation. Beep. wOOt! Everything is right with the world. After loading an operating system (WinXP Pro), it is time to choose a 'TV resolution friendly' HTPC front-end app. The ATI Multimedia Centre software that ships with the RADEON 9600 AIW is a pleasure, with programmable hotkeys and its own navigation side-bar. In fact, when you consider the 9600's overall performance, the IR remote, included games and the HTPC software, it is damn good value. However, if the hardware you are using is not as purpose-built, a freeware app such as myHTPC (http://myhtpc.net), will probably suit your needs. I chose to keep most of the data storage external, with a FireWire 120GB drive and a USB2.0 30GB for MP3s. Video capture is handled by FireWire, with the still-camera dock on USB. The NAD pre-amp is for connecting a turntable. The brilliant Minitar 802.11g wireless LAN is tied back to a bridged residential gateway, and gives 54Mb/s data rate connectivity to my network for email and surfing. The 'Remote Wonder' is intuitive, and can be configured to keep 'key-clicks' to a minimum. With the software configured, TV connected and 5.1 amplifier wired-up it was the moment of truth for Project Couch Potato. Would it dazzle and amaze my techno-savvy friends? Or would it be blown off as, 'Just another PC in a different shaped box'? It dazzled! So, was the project a success? Is the HTPC concept a viable option in 2004? My answer is a resounding 'yes' … And, even better, it will blow your un-Atomican friends' minds!

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  2) In Rear: PCI slot controller
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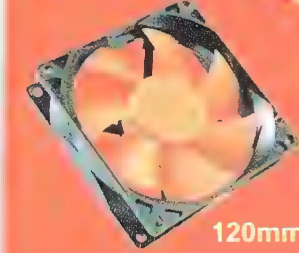
- 120x120x25mm PSU blue LED light fan Two Ball bearing adjustable fan speed, 1300 rpm ~ 2800 rpm
- 120x120x25mm Case Fan adjustable fan speed, 1300 rpm ~ 3000 rpm
- Dual Serial ATA (Advanced Technology Attachment) power connector
- 9 Molex connectors (4 pin)



120mm adjustable case fan

3-in-1 cooler with adjustable fan speed for P4/K7/K8

Full copper base

VOLCANO 12

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Prize planet

You can only enter once per competition or you'll be disqualified. You must provide a postal address and phone number for prize delivery when you enter (not a PO Box).

Star Trek mouse and mouse pad + ST: Voyager DVD box set and ST: DS9 Season 7 DVD box set

Ah... the galaxy of old. Not that there's a galaxy of new, mind you, just that one should always take the time to admire what we already have. Like meditating on a pear before you eat it, or an ice cream. What's even better, is to observe those things that you don't yet have, like a disc full of *Star Trek* episodes, or assorted ST paraphernalia for your computer. So, if you haven't been trekking across the universe, here's your chance. Prepare to fly to the moon and play among the stars with an awesome *Star Trek* mouse and mouse pad, as well as the entire first season of *ST: Voyager* on DVD! Super-secret space thanks to Jade from Paramount for these ever so lovely interplanetary gifts.

Q What was the name of the chief medical officer who was killed in the first episode of *Star Trek: Voyager*?

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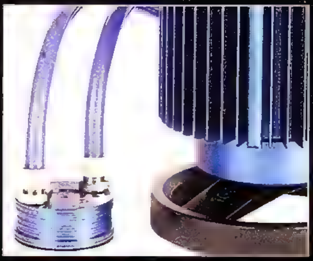
5x copies of Battlefield: Vietnam

It's *so* time for the unbeatable Batman salute! Kaboom! Kapow! Shzam! Reserved only for the hottest of hottest things, we can't think of anything more uncomfortably warm than napalm. Dang, it's so boiling it burns. Despite this fumy fandangling, there is indeed a point hiding in the depths of the text on this page. Be in the running to bag one of five copies of the so very excellent Battlefield: Vietnam by answering the question below. Get it right and you'll maybe win yourself a copy. Big 'Kapow!' to Burchin at EA for this superbly hot prize!

Q According to Lt. Col. Kilgore, what does napalm smell like?



Zalman Reserator 1 from Altech

Want your own warp coil? Well, tough luck, unless you happen to be a Tusken Raider who regularly flies their Droid ship through Federation space. If this is the case, then pick us one up the bomb, too, yeah? Whether that sentence made sense or not, we do have a little something warp-coil looking for you to win. Thanks to the awesome Scott from Altech, we have a Zalman Reserator 1 to give away. It's the ultimate in reservoir-based water cooling. It's a beast, a monster even! To tell the truth, it's an absolutely giant cylindrical slab of blue-finned metal, carved for your delight to dissipate heat like an abominable snowman. And it wants to cool your system. Now.

Q In Terminator 2: Judgement Day, what was the codename of the liquid-metal Terminator chasing John Conner?

5x RalliSport Challenge 2 for Xbox

Rally to us, rally to us! Always wanted to say that, ever since we were little boys, or little boys who tried hard to act like boys, but ended up acting like girls. Despite the pig-tails and lacquered fingernails, we soldiered on against the abuse, our gender disgruntlement a minor blemish in our otherwise bright personalities. It made us what we are today – if you don't include the therapy and elective surgery. We found, through our tribulations, that best way to be man-like is to drive cars, or at least pretend cars. Cheers to Steve Ballmer at Microsoft for supplying us with five copies of RalliSport Challenge 2 for Xbox to pass on to some lucky ladies. Persons! Lucky persons, we mean.

Q What do the engines of the Dodge Viper, Lamborghini Gallardo and BMW Concept M5 have in common?

EMAIL ENTRIES TO WIN@ATOMICMPC.COM.AU OR POST THEM TO: ATOMIC, PO BOX 2286, STRAWBERRY HILLS NSW 2012. PLEASE SEND A SEPARATE ENTRY FOR EACH COMPETITION. PLEASE ENSURE THE COMPETITION NAME IS THE SUBJECT OF THE EMAIL, OR IS DISPLAYED CLEARLY ON THE FRONT OF THE ENVELOPE. THE CLOSING DATE FOR ENTRIES IS 16 JUNE 2004. WINNERS WILL BE ANNOUNCED IN *ATOMIC 43*.

Atomic 39 winners: Amped 7.1-speaker set + Audacity 7.1 sound card combo Q. How does Michael Jackson pick his nose? A. From a catalogue. L. H. Wanga, Golden Grove, SA. Minitar four-port 802.11g wireless router Q. When is it bed time at Michael Jackson's house? A. When the big hand is on the little hand. D. Virulhapan, Castle Hill, NSW. 10 x Unreal Tournament 2004 Q. Why was Michael Jackson spotted at K-Mart ? A. He heard boys' pants were half off. T. Wedding, Jimboomba, Qld. W. Davis, Rivervale, WA. T. McGruther, Brisbane, Qld. R. Testa, Duncraig, WA. S. Williams, Redfern, NSW. R. Wright, Queanbeyan, NSW. S. Clark, North Hobart, Tas. R. Lent, Umina, NSW. M. Oz, North Coburg, Vic. M. Umali, Heidelberg Heights, Vic.

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And what did we say you had to do? Nothing!

Don't check your brain-recorder twice, because there's nothing there! That's not to say you don't have a brain, just that anything you might have recorded in the section where you store things that have been said will be empty – well empty of stuff saying you have to do something to win because in actual fact you just don't have to do anything.

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Atomic 38 winners
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The summer of many things

Maurice 'moz' Ford thunders around Brisbane, howling at the wind and raining water.

Hot weather, ice cream trucks cruising the neighbourhood, BBQs, beer, mosquitos, flying foxes in the trees, swimming, pretty girls wearing a lot less than normal, overheating PCs.

And electrical storms.

I love storms. They are such a raw force of nature. I love the build-up: thunderheads billowing upwards like a nuclear blast. Then the charge as the storm picks up momentum and rolls forward with a power and majesty that defies belief. Buckets of rain, howling winds, deafening thunder....

And lightning.

Lightning is the coolest stuff of all. A light show to rival the gaudiest of Olympic opening ceremonies, free of charge, and no Nikki Webster to ruin it all for you.

There's only one problem with lightning. It wrecks stuff. Like the power supply to houses.

We had a storm here the other day, and although I was impressed with the mayhem and destruction it unleashed, I was less then impressed when we lost the power.

'No probs' I thought to myself as I lit one of my many groovy scented candles. 'It'll come back on soon.' But it didn't.

The storm had come and gone and the power had apparently left hand in hand with it.

After a gruelling 18 hours (yes that's right, *eighteen* hours!) without electricity I began to wonder if my delight and fascination with storms wasn't just a little misplaced.

Our dependence on technology is at an all time high, and as über geeks, none are more dependent than us. But with that dependency comes another – electricity. As a new-ish geek, this fact had never really occurred to me before.

Denied access to my beloved PC and its web goodness, I wandered around the sweetly-scented candle-lit flat contemplating alternatives.

It was a stinking hot night and my pedestal fan had been rendered useless by the storm. So sleep was out. I couldn't stand in front of the open fridge hoping something would take my fancy either. Damn. And so I went through an inventory of electrical things were denied me, and with each item ticked, my despair deepened.

Music, TV, videos, DVDs, games... Even all my pr0n was digitally stored and therefore inaccessible.

So 3am found me in a fitful, sweaty sleep, draped over a partially completed 500-piece jigsaw puzzle. The humanity.

Dawn broke on an eerily quiet suburb. The new day had brought me no joy. Let's fast forward through the hours of tearful frustration to me sitting in my car in the garage. The mobile rings (thank goodness it hadn't needed a charge!) and it's Dave, one of my mates.

'Hey man, what's up?' he says.

'Not much, the power's been out for about 12 hours.'

'Fair dinkum? It's been fine here. So what are you doing?'

'Sitting in the car.'

'Driving?'

'No, just sitting here.'

'Um... why?'

'It's the only place where buttons work when you push them.'

I listened to 30 seconds of uncontrollable laughter before I hung up on him.

He rang me every half hour after that with random gems of trivia like – 'I'm switching a light on now! OOOH! That's bright.'; 'I love this TV show!'; 'I'm hungry but I don't know what to eat... I'll just stand here with the fridge door open.'

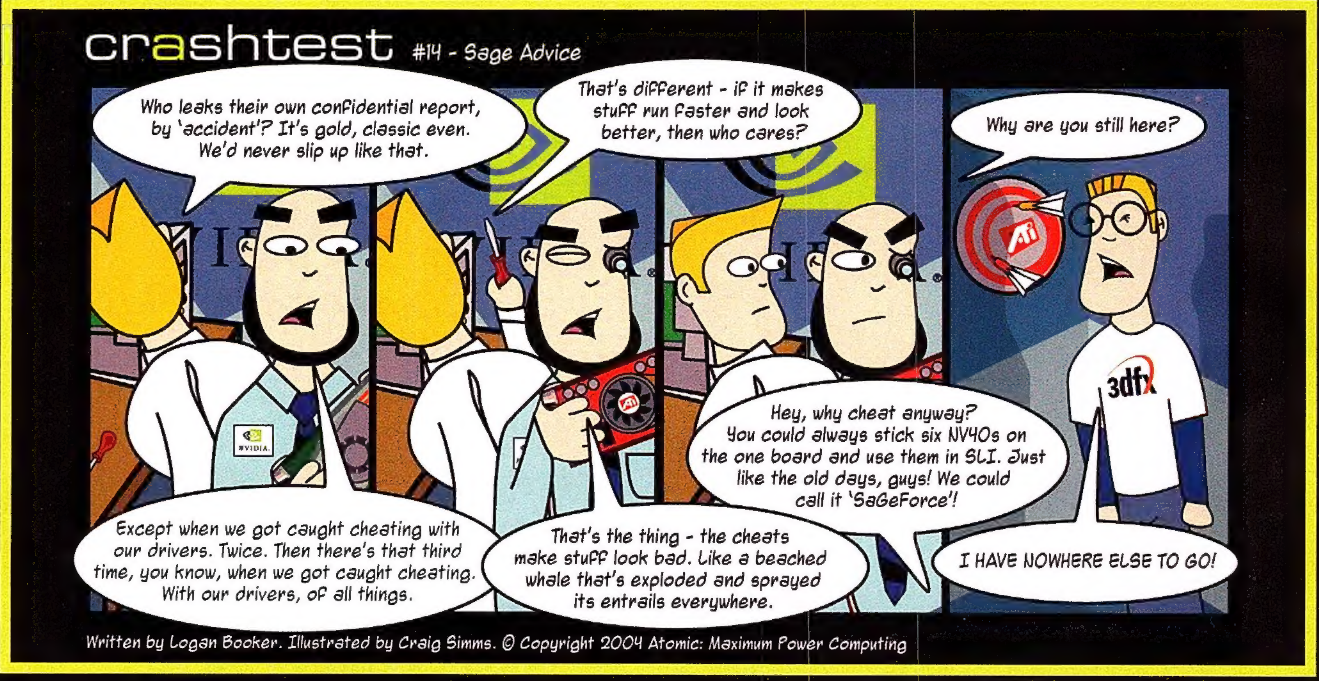
His taunting, combined with the obvious stress of being without appliances for half a day, finally took their toll. My flatmate came home to find me sitting in a corner facing the wall, eyes glazed over and rocking back and forth. Clutched in each hand was a hard drive which had been ripped forcibly from a PC. I was clicking them together and muttering 'There's no place like home' in a continuous mantra.

My flatmate was understandably unimpressed. Especially when he realised the hard drives were his.

I was saved from his vengeful ire by the return of power to our flat.

In case you are interested, I made a full recovery from the episode (Special thanks to the staff at Grants Road Mental Institution) and I came away from the whole experience with some very important lessons.

Don't answer the phone during blackouts, hands off your flatmate's PC and it's time I bought a laptop. Live and learn.



crashtest #14 - Sage Advice

Who leaks their own confidential report, by 'accident'? It's gold, classic even. We'd never slip up like that.
Except when we got caught cheating with our drivers. Twice. Then there's that third time, you know, when we got caught cheating. With our drivers, of all things.
That's different - if it makes stuff run faster and look better, then who cares?
That's the thing - the cheats make stuff look bad. Like a beached whale that's exploded and sprayed its entrails everywhere.
Hey, why cheat anyway? You could always stick six NV40s on the one board and use them in SLI. Just like the old days, guys! We could call it 'SaGeForce'!
Why are you still here?
I HAVE NOWHERE ELSE TO GO!
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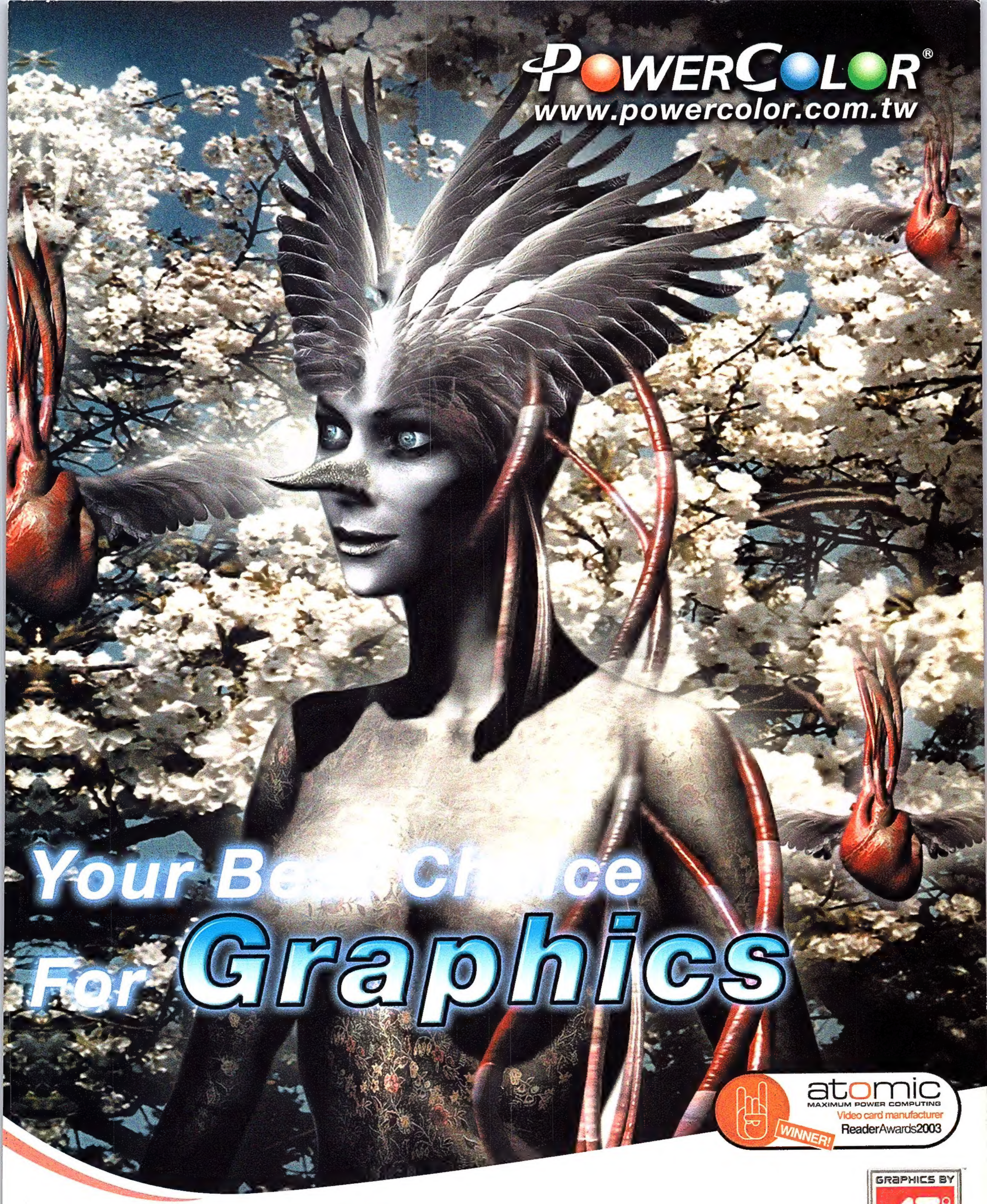

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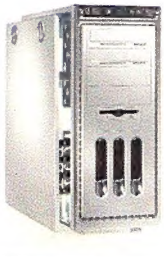

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